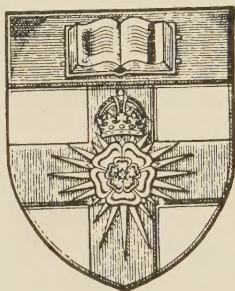
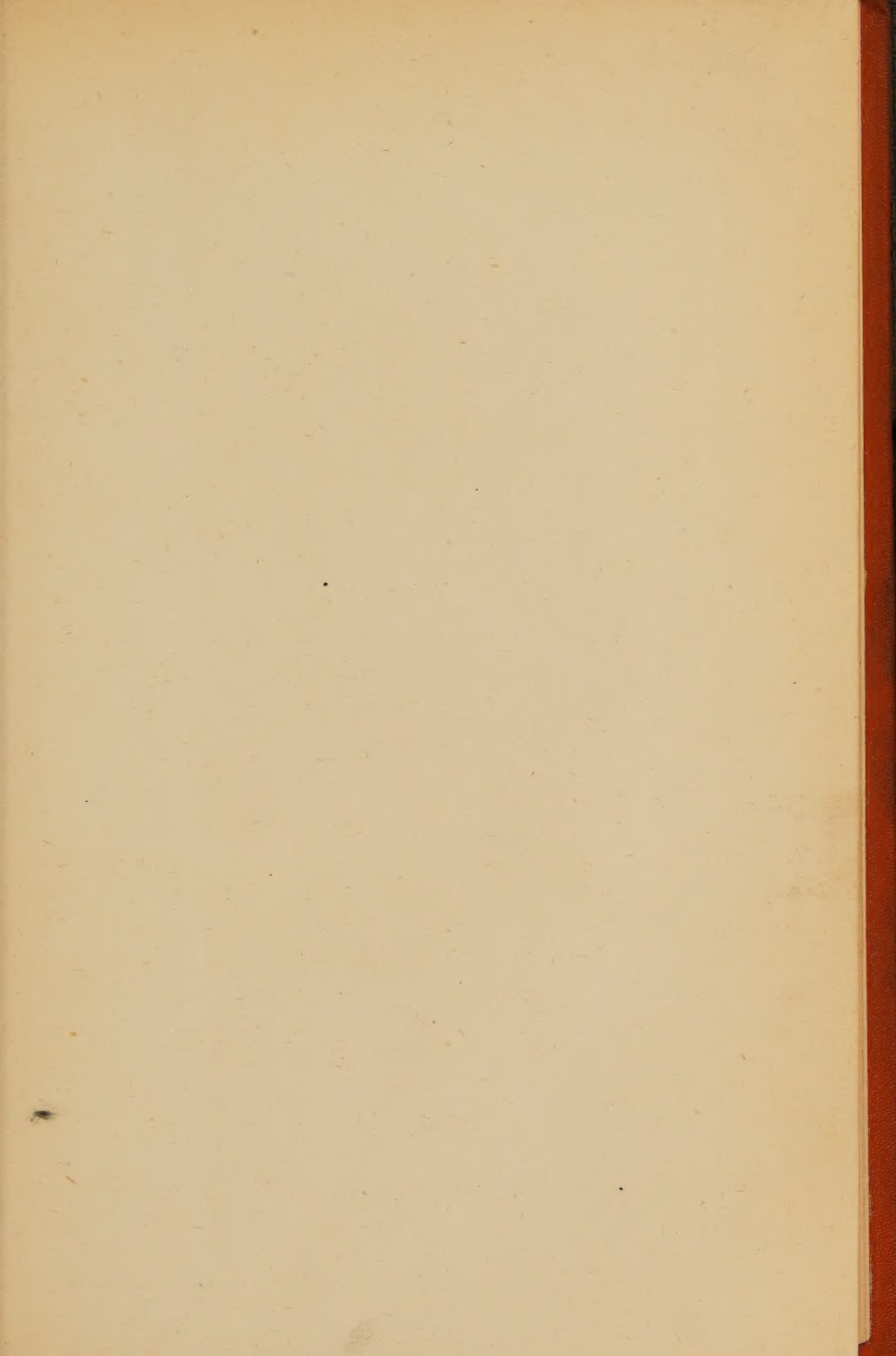


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THE INSTITUTION OF SURVEYORS.

TRANSACTIONS.

VOL. I.

SESSION 1868-9.

LONDON:

PUBLISHED AT THE ROOMS OF THE INSTITUTION,
12, GREAT GEORGE STREET, WESTMINSTER, S.W.

[ENTERED AT STATIONERS' HALL.]

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NOTE.



THE Institution does not, as a body, hold itself responsible for the statements made, or opinions expressed in the papers read, or in the discussions which have occurred, at the Meetings.

The Institution of Surveyors,

12, GREAT GEORGE STREET, WESTMINSTER, S.W.

OFFICERS, 1868-69.

COUNCIL.

President.

JOHN CLUTTON.

Vice-Presidents.

HENRY ARTHUR HUNT

JEREMIAH MATHEWS

RICHARD HALL

EDWARD NORTON CLIFTON

Members.

WILLIAM JAMES BEADEL

FREDERICK JAMES CLARK

HENRY CRAWTER

JOHN BAILEY DENTON

ROBERT COLLIER DRIVER

THOMAS HUSKINSON

JOHN OAKLEY

EDWARD RYDE

EDMUND JAMES SMITH

WILLIAM STURGE

GEORGE TRIST

FRANCIS VIGERS

Associates.

JOHN HORATIO LLOYD

FREDERICK JOSEPH BRAMWELL

Treasurer.

ROBERT DRUMMOND.

Honorary Secretary.

JOHN WORNHAM PENFOLD, 17, Parliament Street, S.W.

THIS COUNCIL WILL CONTINUE UNTIL MAY 1869.

The Institution of Surveyors

Is established—

1. To secure the advancement and facilitate the acquisition of that knowledge which constitutes the profession of a Surveyor, viz.,—the art of determining the value of all descriptions of landed and house property, and of the various interests therein; the practice of managing and developing estates; and the science of ad-measuring and delineating the physical features of the earth.
2. To promote the general interests of the profession, and to maintain and extend its usefulness for the public advantage.

THE INSTITUTION consists of three classes, viz.—MEMBERS, ASSOCIATES, and HONORARY MEMBERS, with a class of STUDENTS attached.

A MEMBER must be more than twenty-five years of age, and have acquired a practical knowledge of surveying in one or other of its branches as above defined, and so practised on his own account for more than five years; or be a member of a firm of surveyors established upwards of ten years. Every Member is eligible for election on the Council, for election or appointment to all offices of the Institution, and entitled to all its rights and privileges.

AN ASSOCIATE must be more than twenty-one years of age, not necessarily a surveyor by profession, but his pursuits must be such as to qualify him to concur with surveyors in the advancement of professional knowledge. Associates are not eligible for the offices of President or Vice-President, but are eligible for election on the Council or for election or

appointment to other offices of the Institution; they have access to the Library subject to the regulations of the Council, and are entitled to vote and take part in the affairs of the Institution at all Annual, Ordinary, and Special General Meetings of Members and Associates.

AN HONORARY MEMBER must be a person who either by reason of his position or his eminence in science and experience, may be enabled to render assistance in promoting the objects of the Institution, but who is not engaged in practice as a surveyor in Great Britain or Ireland. He has the privilege of being present and taking part at all Ordinary General Meetings, and of access to the Library, but no right of voting, discussing, or otherwise interfering in the affairs of the Institution, nor is he called on to contribute to its funds.

STUDENTS, not under eighteen years of age, may be admitted by the Council on the recommendation (according to a form) of four Members and two Associates or of the Member or Associate to whom they are or have been articulated, and they may remain Students of the Institution at and during the pleasure of the Council, until they attain the age of twenty-one years, when they shall cease to be Students.

The Council may accord to Students such privileges, subject to such terms, regulations, and restrictions, as they shall from time to time prescribe.

Any person desirous of being admitted into the Institution (excepting to the class of Students) must be proposed and recommended according to a form, in which the full name, place of business (if any), usual residence, and qualifications of the candidate must be distinctly specified. This form must be subscribed by him, and signed by at least six Members or four Members and two Associates, certifying a personal knowledge of the candidate.

The proposal so made, being delivered to the Secretary, will be submitted to the Council, who, on approving the qualifications, will determine the class for which the candidate is to be presented for ballot.

The following are the rates of contribution to the funds:—

	Annual Subscription.			Admission Fee.		
	£	s.	d.	£	s.	d.
<i>Student</i> . . .	1	1	0	—		
<i>Associate</i> . . .	2	2	0	3	3	0
<i>Member</i> . . .	3	3	0	5	5	0

An Associate may compound for his annual subscription for twenty guineas, and a Member for thirty guineas.

With the view of forming a Library and Collection, all Members and Associates are expected, within twelve months after their election, to deliver to the Council an original paper on some subject connected with the profession, or to make a donation to the Library or Collection.

The affairs of the Institution are under the management of a Council which is elected annually, consisting of a President, four Vice-Presidents, twelve Members, and two Associates. Besides the above, the past Presidents, and the President or Chairman of any local Association in alliance with this Institution, are Members of the Council *ex-officio*.

The Session of the Institution commences annually on the second Monday in November, and continues to the end of May. The Ordinary General Meetings are held on every alternate Monday during the Session. At these Meetings original communications are read on some professional subject, and their merits fully and freely discussed. Every Member and Associate has the privilege of introducing one visitor to these Meetings. Members and Associates are entitled to a copy of any printed publication issued by the Institution after their admission.

OPENING ADDRESS

BY

THE PRESIDENT,

AT THE ORDINARY GENERAL MEETING OF

THE INSTITUTION OF SURVEYORS,

NOVEMBER 9TH, 1868.

GENTLEMEN,

It becomes my duty and pleasure, as your first President, to address a few observations to you on the nature and objects of this Institution. I shall endeavour to compress them into as few words as possible, as it must be sufficiently apparent that the success of the Institution will rest upon the practical efforts and unceasing perseverance of its Members, and not upon any efforts of mine, beyond a few simple words by way of introduction, in these the earliest days of the infancy, of what I have no doubt, with the good-will and energy of its Members, will become a most valuable Institution. But, before I proceed, I must state with what great diffidence I appear before you as your first President. I cannot but feel wholly inadequate to the task of properly supporting the position in which I am placed by the unanimous vote of the Members who first took upon themselves the somewhat arduous and responsible duty of selecting the executive for this Institution. This, however, I may be permitted to say, that though there are very many amongst you much my superiors in intellect and skill in our common profession, there are none who feel a more lively

interest in its well-being, or who have more persistently endeavoured, throughout a busy professional career, to maintain our calling in a position which many of us must have felt has not heretofore been recognized by the public. Many causes have combined to produce this result, but the principal one has been the absence of a common centre of association, to which the public might look as some guarantee of the trustworthiness of its Members. Every other profession or body of men, having a common occupation, has long since perceived the necessity of association, and found the great benefits that have arisen to the Members forming such associations. I can only account for the fact that surveyors have so long remained isolated, without any such common centre into which individual experiences may flow to be discussed and matured, by the recollection that they have hitherto lived and laboured in local centres, distant from each other, formed and maintained by individual energy, but wanting a common bond of cohesion ; and it is superfluous to say how much each one so labouring must have felt the need of an Institution "established to secure the advancement and facilitate the acquisition of that knowledge, which constitutes the profession of a Surveyor." Even the man in the largest local practice must acknowledge the necessity of that finish (so to speak), which can be alone obtained by the friction of mind with mind among professional brethren.

In speaking of local centres, I allude not only to those large country districts, in which many of our Members have taken a prominent and distinguished part ; but I include even this large metropolis, in which there are many local centres ; and it cannot, I think, be doubted, that we shall all greatly benefit by the interchange and expression of thoughts and opinions, many of which can be improved, corrected, and made more useful by discussion and

intercourse. The probable reason why such an Association has only partially been attempted, was the difficulty in olden days of travelling by coaches and slow conveyances, and of inducing individuals to expend so large an amount of time as would have been necessary to attend the Meetings of a society in any central district.

The advent of railways, however, effected a revolution in locomotion; and none have benefited more largely, in every way, than the surveyor, not only from a pecuniary point of view, but as enabling him to associate more freely with other members of his own profession.

The first society of which I have any knowledge, was formed in 1834, and was called "The Land Surveyors' Club." It was in the early days of railways and of other great changes tending to emancipate land and trade from trammels which had, until then, retarded their development and improvement.

It became apparent to the surveyors in and around this great City that changes were in progress which would vastly affect the value of land—the staple article with which they had to deal. In addition to the general introduction of railways, other most important legislative enactments were passed affecting land, and consequently the surveyor. Of these I may enumerate, "The Commutation of Tithes Act," "The New Poor Law Act," the Acts withdrawing generally restrictions on Trade, "The General Inclosure of Waste Lands Act," and "The Copyhold Enfranchisement Act," and other similar Acts, all tending to increase the demand for land. Six members of our profession, feeling the need of a common centre for mutual support, and for facilitating the discussion of subjects brought before them by the new legislative enactments, started the Club, but this society was limited, as its name implied, to Land Surveyors only.

The Land Surveyors' Club eventually became, what its name implied, almost exclusively a dining Club, and, as it was found difficult to dine in larger numbers, was limited to forty Members; but even the meeting for the purpose of dining was found so greatly to benefit the Members in the discharge of their business transactions, that as the numbers of that Club could not be largely increased, others were established both in London and in other large centres of industry, taking into their society not only the land surveyor but also the building and mineral surveyor. These, also, were essentially dining societies; but they all were evidence of the desire for co-operation; and to this end the gentlemen who formed this Institution, and amongst whom will be found representatives of every class of surveyor, commenced their work to combine, in one Institution all the surveyors of Great Britain.

It may now, perhaps, be well that I should shortly state the steps taken to bring about the desired object.

On the 23rd March last a meeting was held, at the Westminster Palace Hotel, of those persons who had given some indication of their desire to see a combination of the various branches of the profession. At this meeting, the following resolutions were passed, viz. :—

- “1. That it is expedient that an Association be formed, to be called ‘THE INSTITUTION OF SURVEYORS.’
- “2. That the undermentioned gentlemen do, with this object, form themselves provisionally into such Association, and take the requisite preliminary measures for organizing the Institution.”

The following were the gentlemen who, by this resolution, formed the Provisional Association :—

MR. CHAS. F. ADAMS	MR. THOS. HORSEY
„ VIRGOE BUCKLAND	„ H. A. HUNT
„ W. J. BEADEL	„ THOS. HUSKINSON
„ F. J. CLARK	„ JEREMIAH MATHEWS
„ EDWD. N. CLIFTON	„ JOHN OAKLEY
„ JOHN CLUTTON	„ EDWD. RYDE
„ HENRY CRAWTER	„ E. J. SMITH
„ J. B. DENTON	„ W. STURGE
„ R. C. DRIVER	„ GEORGE TRIST
„ RICHD. HALL	„ FRANCIS VIGERS.

At the same meeting, a resolution was carried to the following effect:—"That the undermentioned gentlemen, viz., Messrs. Hunt, Clark, Denton, Vigers, Driver, Ryde, Clutton, and Trist, be appointed a Committee to prepare and submit a Report to the Association." Here I am pleased to record the fact that we are indebted to our learned Associate, Mr. John Horatio Lloyd, for being good enough to aid us in the preparation of the above resolutions; and that we have, throughout our labours, been much assisted by his kind and very able counsel and advice. The Committee above mentioned met, and, with the very valuable co-operation of our Honorary Secretary, prepared the Bye-Laws and Regulations, which were duly reported to a general meeting of the Association, then enlarged to about fifty Members, and by that meeting, held on 15th June last, were made and established. At this meeting, also, the seventeen gentlemen whose names appear as the first Council were elected by ballot; and they afterwards selected from among themselves the President and four Vice-Presidents. At a subsequent meeting, the Council had the great pleasure of electing the two Associates, Mr. Lloyd and Mr. Bramwell, who now aid us with their counsel and advice. Thus, gentlemen, this Institution first came into existence.

I need scarcely say that, in common with all things

human, the early promoters of the movement met with many difficulties and some disappointments, and I regret that a few of the most eminent and respected of our brethren are not found in our List of Members. As the Council is from necessity limited in number, it was most difficult to make a selection of representative men at the Board; but I can conscientiously assert that it was the object of all concerned to extend it as far as possible, so as to embrace gentlemen representing the various branches of our profession. Fortunately for the Members generally, they can at the end of the first year reform (if reform is needed) the present Council, which has undertaken the somewhat arduous duty of bringing the first year's operations to a successful issue.

So far as we have gone I think I may congratulate the Members of the Institution upon the success which has attended our work. We have now enrolled amongst us 131 Members and 19 Associates, and I am sure that as the Society becomes better known its Members will largely increase. It cannot, I think, be doubted, that great benefit will be derived from frequent intercourse; and that the public at large will benefit by the more wholesome practice which must follow from such intercourse: for I cannot conceal from myself the fact that, as individuals, we have sometimes forgotten our true and legitimate position as Surveyors and Valuers, and have allowed ourselves to become partisans and advocates; and that, under the guise of giving opinions, we have allowed our zeal or our imaginations to lead us somewhat astray. The business of the surveyor, I hold to be, to give an unbiassed opinion upon the subject placed before him, and not to become, in any sense, the advocate. As it was once said by a respected surveyor, upon being asked if he was "concerned" for some one, he replied, "I am employed by him; but not 'concerned' for him." If we could only keep this in view, such startling

differences as have been found amongst surveyors, will seldom be met with: for it can scarcely be possible that such differences can properly exist between respectable men, having, as we ought to have, a proper regard for our profession, and the society to which we belong.

This Institution has, in truth, like other similar Institutions in this great country, arisen from the wants of society, and being the natural result of its present state, promises, I think, to be both useful and lasting.

Law, physic and divinity, have long had their several internal regulations. The City trades were formed into companies so long since, that in some cases the original foundation is lost. The lovers of wisdom originated the Philosophical Society two hundred years ago, and in no part of the intervening period has that society failed in its transactions; the Royal Academy of Painting has celebrated its centenary; the Society of Arts has continued with more or less success for 115 years; and many kindred societies have subsequently been formed, and have worked great good, both to their members and to the public. One is worthy of special mention—The Institution of Civil Engineers. It appears from their records, that a society, or rather a club, was formed in 1771, mainly by the efforts of Smeaton; but the members were few, and it was most difficult to get together more than four or five members at a meeting.

This date takes us back to the time when Brindley and Smeaton were required to form canals to convey the enormous increase in manufactured goods, which ensued on Watt's improvement of the steam engine, the foundation of the subsequent eminence of the country. The recovery of coal at a reduced cost gave the country that power of cheap production which ultimately so burdened the canals, that goods waited for weeks at Manchester for their turns of

transit, and yet the canals carry to-day, between that place and Liverpool, more goods than they did before the railways were made. Canals, bridges, roads, harbours, and railways have in succession developed the latent powers of the engineers, and their institution originated when their works became of importance.

It was not until 1817 that the present institution was established, and it is recorded, "that a few gentlemen, impressed with the difficulties young men had to contend against in gaining the knowledge requisite for the diversified practice of engineering, resolved to form themselves into a society for promoting a regular intercourse between the persons engaged in its various branches, and thereby mutually benefitting by the interchange of individual observation and experience."

How well does this describe our own position, and what we must all have many times felt.

Now what has been the result of the establishment of the Institution of Civil Engineers, both upon its members and the public at large? It numbers now about 1,500 members of all classes. Meetings are held weekly during the session, at which the average attendance is nearly 250 persons. And surely it cannot be doubted, that the mighty results brought about by the labours of the civil engineer could never have been accomplished, if the individual members had not been able to secure the aid and support of the important body to which they belong. Thus will it be with this, our Institution, if the Members are only true to themselves and the Society. For the surveyor's practice, like that of the engineer, is greatly diversified; and it is scarcely possible that any body of men can have to deal with more important and more constantly varying and increasing interests than the surveyor.

The Royal Institute of British Architects is also of a

kindred character; but confined almost exclusively to architects in practice. It was formed in 1834, and now numbers upwards of 600 members of all classes. The Architectural Association, which consists chiefly of students and the younger members of the profession, may also be mentioned. This was established in 1842, and has now upwards of 400 members. The Mining Engineers' Society, of Newcastle, was started in 1852 with 80 members, and now comprises 320 members; publishing, monthly, a most valuable series of transactions. This society admits coal owners, as having a material interest in the success of the institution, and any literary, scientific, or practical members of other professions whose labours, talents, or professional experience can aid its labours.

Although the Institution of Civil Engineers may be the society to which we are most nearly allied, there are many other societies to whom we are indebted for much knowledge that is essential to the surveyor. For instance, the Geological, the Botanical, and many others, which aid in the formation of that judgment, required successfully to deal with land under its different circumstances of soil, locality, and climate.

The founder of geology was a surveyor who travelled more than once over the whole of England, before he made sections from side to side, and delineated with an accuracy which has well stood the test of time, the order in which the several strata, from primary to tertiary, rise successively to the surface, between the Welsh hills and the eastern coast; and to him, as a geologist, the country is indebted for the opinion, that the Durham coal field underlay the magnesian limestone. This opinion was the basis of expenditures varying from £100,000 to £300,000, to pierce through that limestone to the coal at a depth of 1,500 feet, expenditures most profitable, and adding nearly one-third to

the area of the Durham coal field. Now what would that man have given for the support of an Institution, which could have endorsed his facts twenty years earlier than he could himself force them upon an ignorant and, to a certain extent, unwilling public?

In a great and free country, where land is constantly being converted to more valuable purposes, and where the value may vary from a few shillings to a million pounds per acre, it must be apparent that the surveyor, through whose hands all these transactions pass, and by whose skill and experience the face of the country is changed from barren wastes to fertile fields, and prosperous thriving towns, with their docks, railways, and every variety of commercial and manufacturing premises, must, to discharge his duties effectually, be a person of enlarged and cultivated knowledge; and it is evident that the surveyor has not generally held his proper position amongst the professional men of Great Britain. There can be no doubt that the duties of a surveyor have increased to an extent and importance which demand the establishment of an Institution; and I am proud to be one of those met together, this day, at the commencement of a new life for a profession to which many of us owe so much, and to which we are all attached.

I endeavoured just now to shadow forth some of the reasons that tended to depreciate our position in the public opinion; but there are others. A considerable number of the men in country districts called "Land Agents" are, in fact, not surveyors at all. Many most respectable gentlemen are entrusted with the management of land, whose education and early pursuits were directed to entirely different objects. Gentlemen learned in the law and physic, officers of the army and navy, and members of other classes of professional men, think themselves competent to manage and deal with land.

How strange would these gentlemen think it if the surveyor advised on abstract questions of law, or ventured upon a surgical operation, or undertook to manœuvre a regiment of soldiers, or to navigate the channel fleet; yet officers of these services undertake the management of land, than which nothing requires a larger amount of professional knowledge and experience to manage properly and successfully.

I have time left only to indicate briefly some of the various duties of the surveyor, commencing with the ancient forest.

In years gone by, the planting and management of the oak forests would have been one of the duties of a surveyor; but the days of oak forests are numbered, and iron supersedes wood in the walls of old England. At present, the surveyor's attention is chiefly directed to plantations for ornament and shelter, but there is room for clothing many bleak sides of hills with trees, to the profit of the owner and the advantage of the country.

The surveyor now has to devise the most inexpensive and ingenious ways of rooting up the remains of the forest and converting the soil into productive land, and the clearing, road making, fencing, and draining; the erection of farm premises, and the finding suitable tenants; with the framing of leases for the due cultivation of the land, holding an even balance between the lord of the soil and his tenants. All the above are works requiring great knowledge and experience. At another period the surveyor has to convert and utilize land for building, to lay out and make roads and sewers, and in fact prepare the land for the builder. So again with docks and railways. The surveyor not only measures and maps the ground to be converted to commercial purposes, but his skill and experience are again brought to bear upon the sale and purchase of the land

before the engineer can commence his operations. The surveyor's services are again required in the measuring of buildings and estimates of their value, and also in the estimate and sale of wharves, docks, and other commercial property; and last, though not least, the services of the mineral surveyor are necessary in the management and exploration of our mines. These all afford vast fields and scope for the skill and experience of the regularly educated surveyor, and it is evident that miserable failures must be made by men who assume to be surveyors, but who have had no proper education to enable them to carry out the important works briefly enumerated above.

There are one or two subjects which must shortly more engage the attention of the surveyor. To mention one only, and that, perhaps, the most important, viz., the utilization of the refuse and sewage arising from our population. Hitherto the object appears to have been to get rid of all such matter, at a great cost, into the nearest stream or water-course, thereby transferring to other localities the nuisance and evils arising in our towns. Scarcely any attempt has been made to convert the most valuable manuring matter to any useful purpose. It is for the surveyor to aid in the application of this matter, so as to render our fields more productive, and to convert a substance which, misapplied, is so destructive of life, to the support of life, and the increase of the nation's wealth and happiness.

I will not here enter upon the large questions which are now ripe for discussion, viz., Whether the dry earth system is the better method of conveying away the more valuable manures contained in sewage; or, whether we must continue to use the present expensive mode of getting rid of it by sewers, which have not only to be made large enough as at present usually constructed for sewage proper,

but for the rain-fall also. The question to be discussed in this room would be, Whether the manuring value of this refuse is better and more economically applied in a fluid or dry state? and I hope soon that some one of our Members will prepare a Paper, and so lead to a full discussion upon this most important subject.

It now remains for me to indicate the line of action which this Institution is likely to take. Offices and a convenient room for our meetings have been secured, to which is attached a Reading Room and Library, open at all times to Members of the Institution; the room will be supplied with papers, &c., for the convenience of Members.

General Meetings it is at present proposed shall be held in this room on alternate Mondays, at 8 P.M., in the seven months beginning in November and ending in May. At these Meetings Papers will be read upon subjects interesting to the surveyor, and discussion will afterwards be open to the persons present. It is proposed to print and distribute the Papers, with a short statement of the discussion which may have taken place.

The Bye-Laws and Regulations have been prepared with great care, and I hope they will be found sufficiently matured to be a basis upon which to rear an important structure. But, however sound the foundation, the ultimate completion of the Institution, its future prosperity and usefulness, and, indeed, its very existence, must depend entirely on the good sense, the personal conduct, and the individual exertion of every Member; and I feel assured it will be enough only to mention this circumstance to command the best efforts of the Members, always bearing in mind that talent combined with respectability are preferable to mere numbers; and that, from too easy and promiscuous admission, unavoidable and not unfrequently incurable inconveniences perplex and sometimes destroy societies.

The Council hope that the Members will bear in mind that it is important to have a good library, and that books and maps should be presented at an early period. It will also be of great value to have plans and reports of works executed or designed, with the result of their cost, &c.; and it is hoped, in course of time, to make the Institution a centre for the accumulation and diffusion of all information and matter of interest to the profession.

Our very able Honorary Secretary has kindly, for the present, undertaken to carry on the business of the Society with the aid of an Assistant Secretary. The Institution thus fairly started, must run a successful course, if the Members are only true to themselves, and it will prove of great advantage both to the Members and the public.

Mr. J. H. LLOYD (Associate of Council), said : I believe, sir, I have your permission to address a few words to those present on the occasion of this our first meeting. But before proceeding to do so, I propose to ask all here assembled to concur, as I am sure they will be most ready to do, in a cordial vote of thanks to the President, for the very able, interesting, and exhaustive address, which has just been delivered, and I shall conclude with submitting a resolution to that effect.

I am not presumptuous enough to suppose that in what I am about to say I can add any thing to the weighty matter and comprehensive topics of that address. My task is of a humbler kind, namely, to throw out a few suggestions, by way of exhortation and encouragement, which, offered as they will be in all sincerity and kindness, and proceeding from one who has been long associated with your profession, and yields to no man in the interest which he takes in its well-being and success, may not be considered as out of place on this occasion, or altogether unworthy of consideration.

Your President, gentlemen, has expressed his regret that some, and not the least eminent of your common profession, have not thought fit, at present, to enrol themselves among the Members of the Institution. In that regret we must all share. With some of those to whom the President probably alludes, I have talked the matter over, and have found that the reason assigned for their non-adhesion, is a doubt as to the practical usefulness of such an institution, and a mistrust of its success.

Now, I am not an admirer of and have no sympathy with the race of doubters. Head-shaking is a very easy thing. It is not by doubters that good and useful objects are accomplished. It is by the men of energetic will, of resolute purpose, of dogged perseverance—the men of faith and hope—who see in difficulties only things to be overcome:

“ Our doubts are traitors,
And make us lose the good we oft might win,
By fearing to attempt.”

If Columbus had doubted, or listened to the doubts of others, would he have crossed the pathless Atlantic, and discovered a world beyond ?

If Cyrus Field had lacked faith and courage, would those wondrous cables have been now laying in the depths of the ocean, which link the old world that Columbus left, to the new one which he found ?

And so, to compare small things with great, how has any of the many useful and flourishing institutions of our age and country, to some of which your President has referred, been raised from small beginnings to their present height, except by those, who having the will, believed also in the power to work out the results they aimed at ?

It has been asked by the sceptics, Who and what is a surveyor, and how do you define the qualification ? My answer was and is, we need no definition. Theoretically

there may be a difficulty, practically there is none. Those whom I see before me and beside me are surveyors, differing, it may be, in their special functions and practice, combining, perhaps, some other profession, but yet all having the one common character of surveyors. Again, it is said, But how are you to discriminate in your choice of Members, how determine whom to elect and whom to reject? Am I to be brought into association with every man who puts a brass plate on his door with the title of "surveyor;" or with persons of disrepute in the practice of their calling? Again I answer, leave this to the practical good sense and judgment of the Council who will recommend and of the Members who will elect.

It is neither necessary nor practicable to draw a sharp line of demarcation, but broad distinctions will be plain enough. In the fleeces of a flock of sheep there may be all gradations of colours; but, however difficult it may be to distinguish between the shades of lighter or darker brown, it will always be easy to recognize the black sheep.

Let us then disregard these doubts and scruples, and at least make a beginning and a trial. If we fail at last, we shall have the consolation of having meant well, and done our best; and, for my part, I hold that to fail in the endeavour to accomplish a good work, is a nobler thing than not to make the endeavour at all.

And what is it that, in the baptism of this our infant Institution, its sponsors promise, or, if they cannot yet promise, at least hope for it in its adult state? They aim, I conceive, at three things: 1st.—Intellectual advancement. 2nd.—Social elevation. 3rd.—Moral improvement. Now, as to the first of these. It will not be disputed that knowledge is a good thing, and that the fuller and more accurate the knowledge, the better. But will any one among us here presume to say or think that he is

so perfect, even in the knowledge which appertains to his profession, as not to need instruction, or be incapable of benefiting by discussion? Your President has enumerated many branches of knowledge directly bearing upon and connected with the practice of your calling. Can any one here say, that in each and all of those subjects he has not something (nay much) to learn? It is that varied and multifarious character of the surveyor's business, to which I have before alluded, which makes, as it seems to me, an Institution such as this peculiarly valuable. Take, for example, that branch of your practice which is properly expressed by the term "Surveyor." The surveyor is not only a private practitioner, advising and acting for individual clients; he may be a district surveyor, or a surveyor to a local board of health, a county surveyor, or the surveyor of an important public department. In each of these functions a large and special range of knowledge may be required. Roads, bridges, sewers, drains, woods, forests, wastes, enclosures, reclamations, and many other like matters, may be brought under his superintendence and tax his intelligence; would it not be well that on these things he should be well informed? Again, under the Lands Clauses Act, how many and varied are the subjects which come within the province of the surveyor? The law, among other things, with a wise jealousy, requires that, in the case of limited interests in land, no voluntary agreement with the promoters and the limited proprietors shall be binding or effectual, unless sanctioned by the concurrent opinion of two able practical surveyors; and to perform that duty well and conscientiously, much and accurate knowledge of the value of property of all kinds is imperatively needed.

As valuers, indeed, your duties are as important as they are various. You are called upon to make valuations for

all sorts of purposes—for family arrangements, transfers, mortgages, insurance, leases, rating, and the like. These, and more especially rating, may apply to many and different subjects,—land, houses, factories, plant, and machinery, docks, railways, canals, mines of all kinds, gas and water-works. Surely the amount and variety of knowledge required for the exercise of these functions is not slight or easy of acquirement. Again, you may be selected or appointed as arbitrators or commissioners to value estates for partition or exchange, or as receivers under the Court of Chancery; and beside these occasional duties, you may be entrusted permanently with the management of extensive properties, in the character of agents. Need I point out how large an area of knowledge the requisite qualification for these important offices necessarily covers; and when I add that on many of the subjects embraced within that area, there is diversity of opinion and conflict of theories, and that the results of actual experience can be arrived at only, or at all events best, by discussion and mutual communication, you will see, at once, the value of such an Institution as this.

Further, in the character of witnesses and as arbitrators is it not desirable that you should bring to the consideration of each case an intelligent appreciation of all its bearings; and that not merely from a technical or empirical knowledge, but from a large and comprehensive grasp of the whole subject, which may be applied with effect to the particular matter before you? A judge has to listen to and weigh the evidence and the arguments of counsel, and he may be able to decide correctly enough by merely hearing and apprehending what is so laid before him; but is he not, *cæteris paribus*, a better judge for being also a sound lawyer? No one, for example, is better acquainted than my accomplished co-Associate, Mr. BRAMWELL, with all that relates to

machinery and mechanical appliances of every kind; and when he gives his evidence before one of you as arbitrator would you not wish to be able to apply an intelligent mind to what he lays down? Many of you, no doubt, have distinct departments in which you practise, and have special aptitudes for such practice; but this does not dispense with a general knowledge of the principles and practice of your profession as a whole. One medical man devotes himself to the treatment of consumption; another holds himself out as an oculist; a third takes up as his specialty the treatment of nervous disorders: but can either of these efficiently practise his specialty without being a learned and skilful physician generally? Illustrations of the same kind might be multiplied indefinitely, but they will readily occur to your own minds; and as medical men, and men of scientific pursuits generally, associate themselves for the purpose of giving and receiving the results of their experience and researches, and profit collectively and individually by the intercommunication of knowledge and ideas, so I hope and believe that this Institution will afford a central store into which each may cast his quota of information or suggestion, and into which each may dip his hand and go away a better and more accomplished surveyor.

Then, secondly, as to social elevation. All experience tells us that associations such as these, having for their object mutual aid and improvement, tend to raise the members to a higher level in the social scale. The world is apt to value us as we estimate ourselves. Hitherto you, as surveyors, have had, as your President has expressed it, no common centre—no principle of cohesion—and, consequently, no *esprit de corps*. Men have been apt to regard you simply as persons to be hired to do a certain work; and you have to some extent justified them, by acting too much each for himself in a race of competition. Associated as an

Institute, you will command the respect due to a public body having higher aims, and will take your legitimate rank as a recognized profession. It has been so with all similar institutions. Take, for example, that established by the solicitors and attornies, and known as the Law Institution. There are still, no doubt, in that as in other bodies, a few black sheep; but I can testify, from my own observation and experience, that the *status* of the profession as a whole has been very greatly elevated since the establishment of that association,—partly by the greatly improved training required of those who aspire to become practitioners, and mainly by the strict enforcement of regulations for securing, as far as possible, integrity and honourable dealing in the responsible duties which they have to discharge.

And this connects itself with the third advantage specified, as to be hoped for from the establishment of this Institution, *viz.* :—The moral improvement of the individual Members. Now it would ill become me to set up as a censor of morals, and I should rightly draw down on myself the rebuke of “Physician, heal thyself.” No one is more sensible than I am of my own individual faults and shortcomings, or of those which attach to the body of which I am an humble member. But we are here to-night taking friendly counsel how we can ~~make~~ ourselves better and wiser, and, on such occasions, plain speaking is more appropriate than compliments and flattery. Now what is one of the strongest incentives to, and sanctions of, high moral principle and conduct? Is it not what is called public opinion? But when men talk of the opinion of the world as a thing to be feared or prized, as the case may be, they mean not the opinion of men in general, but that of the persons whom they know, and to whom they are known—those with whom they are in constant or frequent association. And institutions and meetings such as these, are

the best and surest medium of making the power of that opinion felt and acknowledged. There is a sort of atmosphere peculiar to an association, a tone belonging to the body as such, to which individuals must and do adapt themselves. It is, for example, one of the greatest advantages of a public school or a college, that association begets a sort of instinctive sense of honor and propriety. A man is ashamed to do what he feels to be contrary to the recognized usages of the society to which he belongs, or derogatory to his character as a member of that society. So may we not hope that insensibly, perhaps even unconsciously, a higher standard of moral observance may be attained by means of this association. And here I would, if without offence I may do so, endeavour to give a more particular point to these observations. You are called upon, as I have already said, to act as witnesses and as arbitrators. Now, in the latter capacity, I bear my sincere and willing testimony that, as a rule, no men, or set of men, could perform the duty so assigned to them in a more conscientious spirit, or in a more upright manner; as judges, though you may err sometimes, being fallible men, in your conclusions, you are beyond cavil or suspicion as to motives or inducements. But in your character of witnesses, my observation teaches me, that I cannot speak of you all in terms of such unqualified commendation. Your zeal for the interests of your clients not unfrequently warps your judgment, and puts a strain upon your conscience. Now zeal is a good and laudable thing, but truth and integrity are better, and ought never to be made subordinate. Rash and exaggerated statements, sometimes even volunteered in the witness box, should be avoided, even on the lowest ground of mere expedience, for they harm rather than benefit the cause they are intended to serve, and bring distrust and discredit on those who make them. A

client may fairly require of you the best exercise of your judgment and skill in his behalf; but he has no right to expect you to pander to his cupidity, or to lower your own self-respect and soil your reputation for his gain. Give your evidence, then, modestly, as the expression of an honest individual opinion, but with the consciousness that others as competent and as respectable may entertain and are about to enunciate a different opinion. You will forgive me, I am sure, for speaking thus frankly on a subject which I have much at heart, brought, as I have been, into familiar contact with so many of you individually, and therefore anxious that no stain should rest on the body of which you are members.

“ Only to yourselves prove true,
And it must follow, as the night the day,
You cannot then prove false to any man.”

Let not your profession be degraded into a mere money-making trade. To procure a competence, or even wealth, by the exercise of your abilities and skill, is an honourable ambition; but it should not be regarded as an end to be attained by any means, nor indeed as an end at all, but as itself the means of procuring other good. Wealth should be sought, as it is beautifully expressed by Burns,—

“ Not for to hide it in a hedge,
Nor for a train attendant;
But for the glorious privilege
Of being independent.”

And this loftier view of your common profession, and of the duties and moral incidents which belong to it, is, I conceive, one, and not the least important, of the aims and probable effects of this Institution.

And now I would conclude with a few words of practical advice as respects the Institution itself and the use to be made of it.

If it is to be made a success, it can only be so by sus-

tained effort and active co-operation. All associations of this kind, however well commenced, are apt to languish from lukewarmness and indifference. To the younger Members, especially, I would say, "Make the most of the advantages which it offers you as a training or educational institution. A few hours spent in the library or the lecture room may well be spared from the club, the theatre, or the billiard room." And, to all, I say, "Do not slacken in your attendance. Your families will not grudge an hour or two in a week employed in giving and receiving knowledge, and endeavouring to promote the interests of your profession. And do not be restrained from presenting a paper to be read on any subject of interest, by an apprehension that it may not be perfect as a composition. If you have anything to impart, give it freely and without hesitation." Matter is more important than manner,—substance than form. When a paper is announced to be read, or a subject given out for discussion, read up for it, think about it, and come down prepared to take part in it. Bacon tells us that reading makes a full man, writing a correct man, and speaking a ready man. Read, then, that you may be full, write that you may be correct, speak that you may be ready. I am sincerely desirous that this experiment should be a successful one. It may be that I shall not be spared long enough to contribute much to that success, but so long as the opportunity exists, I shall be willing to afford it all the aid and encouragement in my power; and, I say unfeignedly, that it would shed a glow over the evening of a not unchequered or uneventful life if I were permitted to see the Institution which has been planted this night, take root downward, and spread out its branches upward and outward, and bear good fruit abundantly.

Mr. LLOYD concluded with proposing a vote of thanks to the President, for his address just delivered.

Mr. RICHARD HALL (Member), in seconding the vote of thanks, would not, after the pertinent remarks of Mr. LLOYD, detain the meeting; he would only just say, that he admitted being one of the doubters at first, but he expressed his willingness, at the same time, to aid the project, and being thus led to take an active part in the formation of the Institution, he was now convinced it would be a perfect success.

The Motion was then put to the meeting, and carried by acclamation.

The PRESIDENT was glad to have this expression of approval, by the meeting, of what he had said, and hoped the Institution, among other benefits, would force on the public the acknowledgment of that position which the surveyor had attained at so much cost and labor.

Mr. F. J. CLARK (Member), said, the meeting ought scarcely to separate, after thanking the President for having given to them the experience of a lifetime, and of a business he might almost call gigantic, without also expressing to Mr. LLOYD their thanks for the great interest he had always taken in their profession, and the readiness with which he came to the aid of any project they had in hand with his purse or with his counsel, and which he had so well illustrated this evening by joining them simply as an Associate, and in the eloquent address, to which they had all listened with so much pleasure.

The Motion was seconded by Mr. T. HUSKINSON (Member), and carried unanimously.

A vote of thanks, on the Motion of Mr. E. J. SMITH (Member), seconded by Mr. J. BAILEY DENTON (Member), was also given to the Honorary Secretary, for his exertions in assisting to organize the Institution.

HISTORICAL NOTES.

By EDMUND JAMES SMITH, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
November 23rd, 1868.*

WE ourselves being the ancients, and what we call antiquity having been, in truth, the infancy and childhood of our present age, it may be not inconvenient that the series of practical Papers which will be provided by your Members—a series which we confidently anticipate will stretch uninterruptedly for many years—should be preceded by some notice of the scattered details relative to agriculture and to transactions with property, which, to the mind of a Surveyor, present themselves in ancient history, and in England prior to the commencement of the era of modern cultivation; and I have to beg your indulgence accordingly for the imperfect Paper with which I propose to occupy your time, and I trust your attention, this evening.

The characteristic of the present system is the cultivation of the soil by freeholders, or by tenant farmers with free labourers; while that of the ages prior to the reign of Henry VII., is that the work of field labour was the task of slaves or of serfs. By whatever instrument however the cultivation of land may have been effected, the maintenance of a population by arable cultivation must have been one of the first steps towards civilization; and corn was grown before the period when history first be-

comes distinguishable from fable. Arable cultivation infers fixed residence and security, without which encouragement of the arts and sciences is impossible ; pasturage involves change and restlessness, and is consequently opposed to civilization. History is full of instances of pastoral nations, impelled partly by cupidity and partly by the insufficiency of their hunting and feeding grounds, overwhelming their more civilized neighbours, and entering into possession of wealth fixed to the soil in the course of a long succession of generations.

The oldest form of civilization known to us was in Egypt, and its characteristic was repose. As far back as history or tradition can carry us corn grew in Egypt, as it grows there still whenever the grower has any chance of reaping the produce for himself. The Nile yearly renews, by its inundation, the fecundity of the land ; an unclouded sun gives that continuity of heat in which the plant delights ; and a return of eighty for one is an ordinary result. The fields have slightly raised banks through which the water runs into straight channels, and is then moved from one to another, much as in our water meadows, except that the foot is invariably used as the paddle to divert the water from one to another channel. The art of mensuration must be one of the earliest arts, as in some districts the banks were annually washed away, so that the boundaries required annual resettlement.

On the Egyptian monuments are detailed representations of ploughing, sowing, harvesting, threshing, and storing. The ploughing was scratching the ground with a forked branch of a tree, the seed was sown with both hands ; the harvesting was cutting off, sometimes the ears, sometimes the straw, with a sickle, or pulling up the straw by the roots ; the threshing was generally by driving four or five horses or oxen over the ears or over sheaves laid on the ground ; and the storing was by pouring the corn into the

mouths of oven-shaped buildings or caves. The barley is to this day pulled up by the roots, and some of the other processes are followed more or less exactly; and the accuracy of the paintings representing these still existing processes, by which they can be tested, is an irresistible argument in favor of their exactness in names and dates and other details where they are the only authority for the facts they disclose.

The cultivation of corn in Judea rather resembled that of England than that of Egypt; and, in extent and shape, Judea is represented by the four counties of Kent, Sussex, Surrey, and Hampshire,—the Surrey hills being raised to 2,000 feet in height and the Hampshire end to 4,000 feet, and the South Downs struck out altogether. The villages were on the tops of the rounded eminences, and the plains were good corn land; and the inhabitants of each village seem to have cultivated their lands in open fields, in a regular course, like the open-field system in England. In Egypt, no manure was wanted; in Judea, none was available, because all animal excrements were required for fuel for their household fires; for they had no coal and no firewood. The portion of Judea between the Surrey hills and the Thames (so to speak) deserves special notice; for the river Jordan, at the point corresponding to London Bridge, enters the Dead Sea 1,500 feet beneath the ocean level—that is, as deep as the coal mines at Sunderland below the sea. No other such cavity exists on the surface of the earth. It was consequently oppressively hot at the bottom of the Jordan valley; and the wonderful grapes, a bunch of which two men were required to carry, were grown on the declivity above the Jordan.

Tyre and Sidon and Phœnicia had no land except a narrow strip along the sea-coast. They depended for their supplies on Cyprus, and possibly Spain, and on Judea.

Hiram gave Solomon cedars and fir trees, in exchange for 20,000 measures of wheat yearly.

As regards Greece, Homer, after describing the five-fold shield of Achilles as representing the sun and moon and starry heavens, the solemnization of marriage, the opposing armies and the ambush, details the representations upon it of the ploughing of the fallow (the ploughman receiving a draught of generous wine at every bout), of the reaping of the corn with sickles and binding the sheaves, of the oxen killed for the harvest-home, of the barley porridge for the labourers, of the vineyard with rich clusters of grapes, of the straight-horned cattle feeding in the marshy meadow, and of the sheep feeding in the higher pasture or sheep slait; and we recognise that the poet must have painted his picture from the life. Any agricultural society might offer such a shield as a prize at the present time. The later Greeks never cared for farming. Their life was a public, speech-hunting, chattering, gregarious kind of life, and they associated together farmers and Bœotian stupidity. Their climate was perfect in the plains—the temperature ranging from 35 to 85 degrees. Their soil produced almost every kind of fruit, and their pasturage was largely composed of thyme, marjoram, and other aromatic herbs of the choicest kind. Therefore, their honey was famous, and they were great bee-masters.

The foundations of Rome were traced by a plough, and in its earlier days a Dictator was called from his farm of four acres when ploughing his own land; and it was the fashion with the Romans in later days to admire the rural simplicity of their forefathers. But, as their power increased, they depended on Egypt, Sicily, and the African coast for their corn, and their own lands were converted into pasture and pleasure farms; and there seems to have been always in store at Rome a large quantity of corn,

to provide against the contingency of unfavourable winds stopping the importation ; and this, in time of scarcity, sold at about fifteen shillings a quarter of our money.

Virgil's *Georgics* ought to supply us with the details of their farming ; but, of the four books, only one relates to what we should call farming, and the others to rearing bees, and minor matters. In that one book the fact stands out that fallow alternated yearly with a productive crop ; and, beyond that there is nothing, except that the several operations are to be executed with due regard to omens and to the position of the stars. Three Greek and three Roman agriculturalists have left prose accounts of the details of Greek and Roman farming. The alternate fallow, the frequent planting of the same kind of corn, the insufficient working of the land, the imperfection of the instruments of husbandry, the few cattle kept, and the practice of burning the straw, indicate that the produce of a given area must have been comparatively insignificant. Moreover, money was worth from 10 to 50 per cent. for other purposes, and the management rested with a slave who had no direct personal interest. There can be no question of the great inferiority of ancient farming to modern practice.

The vine originated in Asia, and we can trace its gradual progress in Europe. In Homer's time there were vines in Sicily, but the wine made from them was poor and sour ; and, seven hundred years before the Christian era, they had scarcely been introduced into Italy. A thousand years afterwards, fifty of the eighty best wines were produced in Italy itself ; and, about the time of our Saviour, the first vines were planted in Auvergne and Burgundy, where the same wine is now produced that was soon after that date obtained from the vines so planted. The extreme limits of its growth are the latitudes of 25 and 52 degrees ; in the

former exposed to the northern, and in the latter exposed to the southern, aspect: and whether the name of Winchester is derived from the growth of the vine on that coast of England, I will not now discuss.

The notices of the value of property throughout this period are still more rare. The transfer of one parcel of land conveyed four thousand years since, shows that some land was then private property. This one tenement is still occupied by the purchaser and his descendants, according to the concurring testimony of Pagans, Mahomedans, and Christians; and the possession is believed to have been undisturbed throughout the whole interval. I refer, of course, to the purchase by Abraham of the field and cave of Machpelah, where Abraham and Sarah, Isaac and Rebekah, Jacob and Leah, and Joseph lie entombed. The one special circumstance which marked the tour of the Prince of Wales in the Holy Land, was obtaining permission to enter into the chapels (as we should call them) erected above these tombs. The natives anticipated death, or insanity or deafness at the least, as the consequence of invading the privacy of the patriarchs.

As practically engaged in effecting sales and purchases, it may be worth our while to note the manner in which this ancient purchase was effected. The purchaser desired to buy a cave. The vendor begs that he will accept it as a gift (as is said in Persia to this day), but intimates distinctly that the field leading to the cave must also be purchased. The purchaser declines the gift (a mere figure of speech), and begs that a price may be named for both cave and field. The vendor names his price, about £50, and the offer is accepted by Abraham, like a prince, without discussion. Probably the plot was an acre of land, with olive trees, some half a mile from Hebron; but we have no measure of the relative value of silver at that date.

I know no other detail of the value of land in Judea, for two thousand years, until the grandsons of St. Jude, the brother of our Saviour, were charged with treason before the Roman Prætor. They appeal to their horny hands, hardened with the cultivation of 24 acres of freehold, on the produce of which they lived; and this is valued in the Roman census at £300 of our money.

In Rome, we find that the wealthiest man, Crassus, derived his riches from the possession of the land immediately around the old city, over which new buildings had gradually been erected; just as the same fact meets us in England, in the United States, and in all countries with large cities. The special value of land in Rome will be apparent to us, as surveyors, from the fact, that Augustus and succeeding emperors repeatedly enacted that no private house should be erected more than 70 feet in height; and that when Rome reached its maximum, it contained only 50,000 houses, including all classes, but a population of a million, or twenty people to each house. Our density of population was, in 1861, about twelve persons to each house in the most densely populated parishes, and eight persons on an average in Middlesex. House rent was, therefore, immoderately dear at Rome, and ground rents proportionally large, and from this the wealth of Crassus proceeded. His residence sold after his death for £30,000. Another house, somewhat later, sold for £130,000; and another house, with its furniture and ornaments, being burnt and totally destroyed, the loss to the proprietor was estimated at £800,000.

The Roman census was much more complete than ours, for, in addition to the names of all persons in the family, it gave the particulars of all their property. The grass and the arable, the vineyards and the olive grounds, the meadows, woods, lakes, and salt pans, were all distinctly stated and valued by the owner in his return, as well as the

male and female slaves and the live stock. These censuses began very early, and were even more exact under the emperors. Augustus ordered that simultaneous census of the empire to which Joseph and Mary went up to be taxed ; and the College of Agrimensores, that is, the Institution of Roman Surveyors, was founded about the same time. It had the charge of business hitherto in the hands of the Augurs, and had amongst its students men of the best families in Rome. It was their duty to measure and value every estate, so that it should be fairly charged with the public imposts. Their mode of surveying was that they ran a line due south from a given point, and then ran another east and west perpendicular to it, and, by a system of squares, ascertained the relative position of fences and the area. Near Begiers there are five and twenty townships bearing the names imposed upon them at the time of their original survey and colonization 1,600 years since, and there are many others in Italy and the south of France bearing their original names.

The College of Agrimensores no doubt originated in the same necessity which has induced us to form this Institution—the necessity for a more systematic practice on our part, and for some security to the state that business of the magnitude and of the confidential character entrusted to the Agrimensores should be properly transacted.

Leaving the ancient world and confining our attention to this island, we find that corn was cultivated in it before Cæsar's first invasion, probably by tribes who had made good their settlement and grew corn along the southern coast, but that the natives in the interior continued to live on milk and flesh, and to be clothed with skins. When Cæsar landed on the 25th August, new style (the exact day has been recently ascertained by the Emperor of the French), the corn was just beginning to be cut ; but before he sailed away on the

12th September, the harvest was secured and his ships re-victualled. And at a subsequent period 600 Roman or Gallic ships carried from England some 126,000 quarters of corn to supply the commissariat of the Romans at a time of dearth in Gaul—this quantity could not have been raised from less than 60,000 acres.

In the succeeding four hundred and fifty years the Roman modes of agricultural cultivation, as well as Roman civilization, overspread the whole country to its northern boundary, and arable cultivation must have been largely extended with it; for the Romans followed here their general practice of imposing on the natives of each district an annual tribute of corn to be paid in kind. This tribute in kind at once provided for the food of their soldiers, and gave some security for the natives' good behaviour: the first sign of an impending insurrection was that the natives neglected to prepare the land for the next year's corn. That very considerable progress was made is evidenced by the remains of the Roman cities, and still more by the appearance of British bishops at several successive councils in the fourth century, and by the ascertained fact that the Britons certainly ceased to exercise themselves in the chase, and in the use of arms. The record of their total inability to protect themselves against the Picts, on the withdrawal of the Romans, is most distinct.

This withdrawal, four hundred and fifty years after the landing of Cæsar, was the commencement of a period of relapse into barbarism so complete, that the light of Christianity was totally extinguished south of the Humber, and only rekindled from Rome after an interval of two hundred years. The hordes of Picts and Anglo-Saxons swept the country, wave after wave, for four hundred years, maintained a great part of that time almost wholly by pasturage; and when the Saxons became united into one kingdom, the Danes

ravaged the country for many years, generally as pirates retiring to their ships with their booty, until nearly the period of the Norman conquest. The laws of the Anglo-Saxons regulate the prices of all kinds of cattle (the pasture master of the herds of each manor being the most important officer), and are nearly silent with respect to arable cultivation. The lord's mansion and demesne was under the care of the bailiff and domestic slaves ; and the rest was held by bondsmen at rents fixed by law, but burdened with oppressive services to the lord.

There must have been some approximation to a survey of the Saxon kingdom before the year 1000, nearly one hundred years before Domesday Book ; for the Dane-geld, a tax of one shilling on each hide of land, was then imposed, and the Domesday Book throughout compares the valuation and number of hides charged in the time of Edward the Confessor with the valuation and number then accounted for, and with the rents then actually paid.

The Anglo-Saxon transactions furnish us also with some glimpses of prices. Thus, a hen was three halfpence, a sheep (of which the value of the fleece was two-fifths) was worth one shilling, a cow was worth four sheep, and an ox worth six sheep ; a horse was worth about five oxen, and a mare about three oxen. One hide of land was sold, the price of which is recorded at 118s. In the terrible famine in Edward the Confessor's time it is stated that corn rose to five shillings a quarter ; which might compare with a present price of 150s.

From the time that Rome withdrew her legions from Britain the imperial power gradually decreased, and the barbarians approached nearer until the seat of empire retreated from Rome to Constantinople, and the whole of western Europe was convulsed by continual wars. It is impossible to avoid perceiving that the gradual restoration of peace in

England was mainly due to the monks and churchmen, whose monasteries and churches contained the only civilized men in the whole kingdom. Neither security nor knowledge were to be found elsewhere. The monks reclaimed the wastes, tilled the land, preserved libraries, taught the people, and inculcated Christianity. One founder is recorded to have made five journeys to Rome after the year 675, and to have brought back masons, painters, and glaziers, and a precentor to teach psalmody; and when his monastery was built he sent to France for workers of painted glass, who came and taught the making of it in England. By such means was civilization kept alive. This monastery was burnt by the Danes two hundred years afterwards; but the monks escaped and rebuilt it, and it continued to the reign of Henry the Eighth.

The exertions of the monks were repaid by grants of land, and as the boundaries of the townships and parishes had been by that time settled, there is little difficulty in identifying these several donations. The possessions of the ecclesiastical corporations and of the universities having been held uninterruptedly for eight centuries, afford the best chance of tracing the gradual increase of rents and change in the value of money consecutively through the whole period. It is remarkable that there is not, so far as I am aware, any notice of tithes in Domesday Book, while the landed possessions of the bishops and abbots are carefully enumerated.

The Norman conquest, being the conquest of a few over the many, substituted an iron tyranny for the weak government of the Saxon kings; and, when the one Danish invasion after that event was supported by the inhabitants of the northern counties, the conqueror took such vengeance as that scarcely a house was left standing between the Humber and the Tees. The result was permanent security

from external violence. Domesday Book was formed some twenty years afterwards from evidence given to five justices in each county.

The county reports give the names of the landowners, and the extent, with more or less detail, of their lands. The landowners' names are frequently arranged in the order of their rank, but in some cases the return is arranged in the order of the parishes. Thus, in Hertfordshire, the borough of Hertford comprises seven owners besides the king, and in the county, forty-four owners besides the king. The king's lands are first described, and the rest in order of rank; the whole occupying forty columns. The king's lands occupy three columns; the twelve ecclesiastics' lands thirteen; the four earls five; and the nineteen knights seventeen columns; after these Edgar Atheling and three little owners follow, and then the tenants of the king, and the list is concluded by three female owners; all these last together occupy two columns.

In Leicestershire, the king and forty-three other owners are arranged in similar order. In Rutland, the parishes follow successively, and all the landowners within each parish are given. You would suppose that from such a survey, so well preserved to us, a tolerably accurate account of the state of the country might be prepared; but to the present time no one has been able to deduce from it any practical results, except as regards population. The leading feature is the enumeration in each parish of the number of hides in some counties, of carucates in all counties; but what is a hide and what is a carucate is not settled.

Admirable facsimiles of the Domesday Book of each county have recently been photozincographed and published at a nominal cost, but the introduction prefixed to them is very unsatisfactory. According to that introduction it is supposed that a hide is 120 acres; also that a hide,

a yardland, and a knight's fee were each as much as were sufficient to the cultivation of one plough; also that a carucate was a ploughland with the proper proportion of meadow pasture and houses belonging to it; and it is added that the hide was the measure of land in the Confessor's reign, the carucate that to which it was reduced by the Conqueror's new standard. These explanations are contradictory to themselves and quite unintelligible.

The hide has been variously estimated as 120 acres, as 24 carucates, as $14\frac{1}{2}$ carucates, as 12 carucates, and as 6 carucates. In the Domesday Book of Leicestershire the word occurs only 14 times; of these 11 mention a hide, or a hide and a half, or a hide and 2, or 3, or 4, or 6 parts; twice it occurs with this explanation, "two parts of a hide, that is 12 carucates," and once with the explanation, "In each hide are $14\frac{1}{2}$ carucates." This last follows a statement that a property consists of 7 hides, 1 carucate, and 1 oxgang. In Hertfordshire each possession is stated in hides and virgates—the latter has been variously estimated at 30, 24, and 15 acres. The carucate appears in all the surveys I have seen, as does occasionally the oxgang as a portion of the carucate. The meadows are generally given in acres.

Remembering that different justices took the evidence in each county, that the evidence was that of the Grieve and tenants, and that these men spoke according to their local usage, no comparison between different counties seems to be possible. We are all aware that to this day the Irish acre, the Cheshire acre, the Lancashire acre, and the forest acre, perplex our minds, to say nothing of the three-rood or common field acre, which is nearly obsolete; and it is only reasonable to suppose that different standards of measure obtained in different counties, and even in different parts of the same county, at a time when we know that the foot varied from 12 to 18 inches, and the perch from 16 to

24 feet, so that all other measures must have varied correspondingly. Within each county it might be possible to arrive at some nearly approximate standard, and I recommend the subject to the notice of our Members. Where forest districts were in question, I believe that a larger measure was always allowed than in a cultivated country. On the church of Edwinstowe, and, I believe, on two other churches in Sherwood Forest, the forest standard measure is cut into the stone for the information of all persons concerned. This foot is about fourteen inches of our measure. With respect to value, the same want of uniformity between the several parts appears. Taking three estates following each other consecutively: in one, £20 in King Edward's time, had decreased to £14 at the time of the survey, in another the value was unaltered, and in the third 16s. had decreased to 5s., about the time of the Conquest, and again risen to 10s.; in three others, two had each risen, since King Edward's time, from £6 to £7 value, and the other had fallen from £20 to £15; in three others, one had varied from £8 to £9, one from 50s. to 100s., and one from 30s. to 100s.

The one thing in which the Domesday Book is probably to be depended upon is in the number of men in each parish, of whom, however, a large proportion are slaves. The king would care more for this part of the account than for increased taxation, and there would be more danger and difficulty in giving false information on this point than in diminishing the extent and the value of the lands, as the king and the lords would have the same interests as regarded men, though opposed as regarded taxation.

The Domesday Book did not extend to the county of Durham; but about one hundred years later, an account of the lands within that county palatine was taken, but

excluding the estates of the free tenants of the county. It relates the state of each parish, and is much more precise than Domesday Book. Taking Boldon parish for an example, there were 22 villans, holding one with another two oxgangs of 15 acres each, or 660 acres together, each villan paying a rent of 2s. 6d. yearly, and 16d. in another form, and half a bushel of oats, and five cartloads of wood, and two fowls, and ten eggs; and they worked three days in each week for the lord, all the year round, except Easter and Whitsun week, and for two weeks at Christmas, besides other heavy duties. And there were 12 cottagers, each of whom held 12 acres, or 144 acres together, and worked two days in each week for the lord, all the year round, except at the festival weeks, and paid 12 fowls and 60 eggs each.

The Pinder, in virtue of his office, had 12 acres of land, and each tenant gave him a thrave of his corn; and he paid to the lord 80 fowls and 500 eggs yearly.

About two hundred years after this survey another was made, including the estates omitted in the Boldon Book, and thus giving a complete view at that date. The free tenants had 266 acres, and were 27 in number; one received the bishop's rents in Weremouth, and was in fact his agent, and had 36 acres without charge, and 26 paid 34s. 8d. for each 10 acres, or about 3s. 6d. an acre. The 32 bond tenants now paid for 22 houses, and 46 oxgangs, with the mill and common rights, £44. The day work appears to have ceased, and the rent to have been about 20s. an oxgang of 15 acres. It is not unlikely that this survey marks the time of the substitution of rent for servile work, which first took place on church lands.

In this two hundred years a considerable proportion of the demesne lands, and probably of the other lands, were gradually converted into arable; and there is every

reason to believe that the numbers of the population had largely increased. From the accession of Edward I., in 1272, to the death of Henry V., in 1422, a period of one hundred and fifty years, there had been continued internal peace and security; and I believe that a close investigation would prove that the cultivation was as far advanced and the population at least as large, if not larger, at that date than it was at the accession of Henry VII., more than sixty years later; for, in the meantime, the wars of the Roses destroyed nearly all the ancient nobility, and desolated nearly every landed estate in the kingdom. The landholders having led their tenants into the field, the numbers that returned were so diminished that the demesne lands were for the most part laid down in pasturage, and, as the surrounding lands were arable, pasturage now involved the inclosure of the pasture closes.

Any connected account of English agriculture should begin from the reign of Henry VII.,—the commencement of free labour generally. To that date the accounts of the operations of husbandry, and even the farming accounts, were written in Latin; but, from the beginning of the reign of Henry VIII., there are a series of regular treatises, written for the most part by persons actually experienced in the subject they describe. Fitzherbert, judge of the Common Pleas, in the reign of Henry VIII., and Tusser, Goodge, and Sir Hugh Platt, in the reign of Elizabeth, being the foremost in an ever increasing list of names extending to the present time.

It may be said that, of a period of 1,900 years from Cæsar's first expedition to the present time, nearly one-fourth passed under the Roman dominion; one-fourth, reaching nearly to the Conquest, was marked by incessant war and rapine; one-fourth, from the Conquest, was freed from external attack, but frequently disturbed by internal strife; and that

there has been a continual and uninterrupted progress in civilization during only the last 400 years,—for the civil wars were conducted with singular humanity, the armies traversing the country with the least possible disturbance to daily life, and the raid of the Pretender to Derby, in 1745, was too brief to occasion more than a momentary panic. No taxation can possibly bear comparison with the cost of internal disturbance, as regards agriculture,—to say nothing of trade, manufactures, and commerce.

At the point therefore where I think our modern history begins, the reign of Henry VII., I conclude this cursory notice: well satisfied if your kindly acceptance tends to induce others to occupy your attention with Papers of a more practical character. Concurring as I do with the other Members of the Council, that this Institution is calculated to be of great value to every member of the profession, and to the country generally, I could not hesitate to make a humble contribution, although fully conscious of its imperfect character.

Mr. THOS. HUSKINSON (Member), responding to the invitation of the President, said the feeling uppermost in his mind was that of obligation to their friend Mr. SMITH for the extremely interesting paper he had just read. They were fortunate, not only in the author of the paper,—for they knew that if careful research, accuracy, and ability were required to constitute a good paper, they were sure to have it from Mr. SMITH,—but also in the subject: for it struck him that, in the commencement of their early life as an Institution, it was important to have an accurate historical account of the subjects which occupied their attention. He had no doubt, as they went on, Members would deal

with particular branches with great research and ability, and he trusted the information thus acquired would be brought to a common centre for the benefit of all. But before they went into the details of knowledge it was desirable to examine the roots of it, and, in the first place, to ascertain what has transpired in past ages with regard to the cultivation of land. What did a scientific man set himself to do? He considered, as far as he could, what other men and other minds, in other times and circumstances, had thought and done on the subject, and then he considered how far the circumstances of the present time had changed, and to what extent they modified the practice of former times; and, therefore, an accurate history of the tenure, occupation, and cultivation of land was of the first importance. And, having ascertained that, they came to a common platform, from which individual Members might diverge into various branches of information which had come within their own personal and special knowledge. Further, they were not only fortunate with regard to the author and the subject, but also as to the time at which it was introduced to their notice: for they must feel that they lived in an age when, not only every institution, but every person, was put upon their trial, and called upon to prove, as the French said, "the reason why they exist." They knew there had been already a great deal of discussion, and it would no doubt be increased, as to the conditions on which land should be held, as regards both the owner and the occupier, and also as regards the circumstances under which land could be most beneficially employed for the development of its resources, and the benefit of the community at large. They knew that the question had been broached especially with regard to Ireland, and, no doubt, it would occupy attention at home, with a view to consider whether there was anything in the mode of occupation, in England,

which limited and obstructed the proper cultivation of the soil. In that question the whole community was interested, and these were topics on which land agents and surveyors ought to be able to form a tolerably accurate opinion. They ought to be in a position to say whether there was anything which, in the present conditions of the tenure of land in this country, restricted cultivation and stood in the way of the results which might otherwise be expected of it. If they did not know, they ought to know, whether there was anything in the existing state of things which could be altered, and in what way it could be improved for the benefit of the community at large. He had no doubt amongst the profession, they had a very decided and accurate opinion on that point, and if, by discussion, they could come to something like a unanimous opinion, he was sure that such an opinion would not be without effect when these questions were discussed and, possibly, legislated on in Parliament. It seemed to him that their attention should be directed to that and kindred subjects, and he thought Mr. SMITH, by his introduction this evening, had laid the foundation for it. He would, therefore, conclude what he had said by proposing a vote of thanks to Mr. SMITH for the excellent and able paper he had read to them, and for his great research and the trouble taken on the subject.

The motion was seconded by Mr. FRANCIS VIGERS (Member), and carried unanimously.

Mr. T. S. WOOLLEY (Member) would be glad to hear Mr. SMITH's opinion with regard to the circumstances which led to the remarkable variation in the value of land which he had spoken of, in certain districts, in King Edward the Confessor's time, and at the date of the Domesday Book; and enquired whether it did not wholly arise from the

devastation of great part of Northumbria by King William himself. He also further mentioned, as an amusing instance of the extreme minuteness of the early writers on agriculture, that Gervase Markham, translating Columella, mentioned in his work on Agriculture, as a necessary qualification of a bailiff's wife, that she should not be too good looking, lest her husband should be beguiled into neglecting his duties; nor was she to be too ill-favoured lest he should be led unduly to seek the company of others.

Mr. E. J. SMITH replied that the devastations which occurred in some parts of the country, more severely than in others, probably accounted, in a great measure, for the difference in the price of land. For instance, all the estates which were described in Domesday Book as Earl (or King) Harold's estates, seemed to have suffered in that way more than others, and realized the smallest value, which led him to that conclusion.

Mr. J. W. PENFOLD (Hon. Sec.) wished also to bear testimony to the great pains Mr. SMITH had been at with this paper, to make it useful and interesting. Mr. SMITH had mentioned, incidentally, one instance that was recorded of the price of land, but there were others,—between A.D. 900 and 1000. It appeared that Ednoth bought two hides of land, at Stapleford in Bedfordshire, for one hundred shillings, and gave them to Ramsey Abbey, and one acre of land was purchased for one shilling, and a hide for one hundred shillings, about A.D. 966. It was difficult to test the value of land by the price of corn, as the markets varied so much in a short time and within limited distances. It appeared that, in 1317, so great was the scarcity of corn in Leicester, that wheat sold at 44s. per quarter; but, no doubt, that was partly occasioned by some local failure or

disturbance, because, on the Friday following, at the same place, it was sold for 14s. per quarter, and the prices varied about that time from 16s. to 2s. 3d. per quarter, sometimes going as high as 50s. or 60s.; and there was one mention made of it being as low as 1s. 6d. In 1401 wheat was dear at 16s.; in 1423 it was sold at 8s. per quarter, in 1445 at 4s. 6d., in 1455 at 1s. 2d., in 1457 at 7s. 8d. It seemed to him if they could get at the rents of the land over a series of years, which might possibly be obtained from church or college records, they would have some specific basis to go upon.

Mr. F. J. CLARK (Member) felt considerable interest in the early cultivation of the Egyptians. He had been in Egypt, and had paid some attention to the system pursued there, and could verify the observation of his friend, with reference to the cultivation being carried on at the present day very much as it was done in the times of Abraham and Moses; and the only feature of difference in the Nile itself, was its being embanked in some districts for the purposes of irrigation. So constant was the periodical overflow of the Nile, that, in the district of Cairo, the overflow was attentively watched by the natives, so as to preserve the cattle if they could not protect their corn. The system of irrigation in Egypt was this. About every half-mile along the Nile, on either side of the river, shafts were carried out, and the water was raised by means of the bucket water-wheel, and conducted into reservoirs formed on the land. The land itself was divided into plots formed in straight lines, and varying from half-an-acre to $2\frac{1}{2}$ acres in extent. A narrow channel was made, and, by men's hands, the operation of irrigation was carried on at such portions of the land as required it. He had seen the fourth crop carried in one year. As regarded the cattle, the whole of the

towns in Egypt were surrounded by walls enclosed by gates. The roofs were flat, and were occupied in the evening by the dogs. The cattle of each family generally consisted of three or four cows of the buffalo breed, having large humps on their shoulders, a goat or two, and five or six sheep. These were driven within the town at night, and the gates being closed, the dogs were left sentinels over them. The costume of the poorer classes was as primitive as ever, consisting principally, for both sexes, of a coarse blue smock. He would not now detain them, however, with his Egyptian experiences, which he would, perhaps, recount more at large on a future occasion.

The PRESIDENT remarked that, in the course of his practice, he had met with some curious remnants of early cultivation. He had destroyed either the whole or portions of many forests. In the New Forest, there are visible the remains of ridge and furrow. The same was the case at Whichwood and elsewhere; as also, the remains of old pot-kilns were frequent. In the island of Portland, the ancient custom of transfer of property by Church gift was until recently preserved. If A sold property to B, the parties repaired together to the church porch, where B paid the money to the vendor; and to this day the ancient King's rents are recorded upon a long pole, by a series of notches. They had no other record of the King's rents except these marks made annually; and the length of the mark indicated the amount which each person had to pay. From the inconvenient access to this island until railways were established, it remained in an almost isolated condition, and many customs were preserved as they had existed for hundreds of years past. The sheep of the island were of a most peculiar breed, and looked as old as Methuselah. They had a most odd appearance, and

the horns surpassed anything he had seen in any part of England.

Mr. GEORGE CHAPMAN (Member) remarked that it would add to our knowledge of the quantities intended in Domesday and other books, if the Members would make memoranda of the local measures and names which come under their notice, and compare them with the measures and quantities mentioned.

Mr. E. J. SMITH said, referring to Domesday Book, he would suggest that each county should be the subject of consideration by the Members. The book of each county had been photozincographed, and the cost of each varied from 8s. up to 35s. He was quite sure it would interest everybody to have a copy of any counties in which they had been in the habit of practising, and then they would very soon be able to assist in clearing up the differences of which they had been told. Domesday Book had now been made accessible; hitherto, it had been regarded as a single Book, whereas it was as much a series of separate accounts as the agricultural reports of each county that were published, from time to time, in the *Agricultural Journal*. It was the same kind of thing on a smaller scale.

The PRESIDENT remarked, that when in Cornwall, he was informed that the land produced only six to ten bushels of wheat per acre, and it was some time before he found out that a Cornish bushel was three times the imperial standard. It showed how very inconvenient such discrepancies of measurement, &c., were, in so small an island as our own. It was the same with regard to weights. In London, the stone was 8 lbs.; in the Midland Counties, it was 14 lbs.

Mr. V. BUCKLAND (Member) hoped Mr. SMITH would be induced, on a future occasion, to bring his history down to more recent times, and observed, with regard to the various customs of outgoing and incoming tenants, that if they could be assimilated throughout the kingdom it would be a great advantage to them as surveyors. It was sometimes the case that a ditch only divided two counties, and, at present, it was a difficult matter for a person going into a strange locality to know what was the custom; for, sometimes, on one side of the ditch, fallows, half fallows, half leys, and half dressings, &c., were to be paid for, and on the other, nothing of the kind; and one farm might, perhaps, require almost double the capital to enter on that was necessary for another, adjoining and similar in every other respect.

The PRESIDENT entirely concurred with the observations of Mr. BUCKLAND. He held that all customs were antiquated, and should be abolished; everything should be reduced to writing. If that were done, no question of custom could arise; but if they did, it was desirable to assimilate them as far as possible. That was a subject which might be usefully discussed in this room, and he should be glad if Mr. BUCKLAND would introduce it by means of a Paper.

THE
EDUCATION OF THE SURVEYOR.

BY WILLIAM STURGE, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
December 7th, 1868.*

THE PRESIDENT IN THE CHAIR.

THE subject of the Paper I propose to read this evening is one which appears to me to be much in accordance with the principal object of the Institution,—that of promoting the interests and raising the character and position of the profession.

I would state, at the outset, that I propose to treat principally of the education requisite for my own branch of the profession,—that of the land surveyor. The practice of the building surveyor is of so much importance and so distinct, as to require a different education; and I trust that some member of that branch may be disposed to read a Paper upon it, on a future occasion.

The present state of education for the profession of a surveyor cannot, I think, be considered satisfactory, or adequate to its requirements, especially when we consider the diversity of knowledge required for competent practice in its various branches, the extensive range of subjects it embraces, and the magnitude and importance of the interests committed to its care. In many cases, surveyors have had no special education whatever; and, at most, the run of a surveyor's office as a pupil for three or four years, with the addition, in some cases, of a year or two spent with a practical farmer, has hitherto formed the staple of the surveyor's



special education. But valuable, and indeed indispensable, as are these advantages, and successful as they have proved in the example of many eminent members of the profession, I cannot think that they are sufficient to enable the surveyor to keep pace with the advancing knowledge and the more exacting requirements of the present day, but that some special course of study is desirable to qualify him for the multifarious duties which will devolve upon him in the course of an extensive modern practice. I propose in this Paper to indicate how it appears to me the special education of the surveyor can be improved, and to consider whether any particular course of study is advisable for the attainment of this end.

The only point I would remark on, in reference to the scholastic education of the youth intended for a surveyor, is that especial pains should be taken to well ground him in mathematics, not so much in the higher branches—though these will in his, as in other cases, be useful as a mental training—as in those which will be of the greatest service in the practice of his future profession. Among these I would mention Euclid, which will not only tend to give him mathematical precision but to strengthen his reasoning powers; algebra, to enable him to understand those mathematical formulæ in which are expressed the laws of so many branches of science; mensuration, both of superficies and solids; and trigonometry.

As soon as the youth leaves school, whether public or private, his special education for his profession should commence in earnest; and the question at once arises, in what that special education should consist, and what are the means most likely to conduce to the greatest proficiency.

And, first, I would discuss the expediency of completing the education of the youthful surveyor at one of the Universities, Oxford or Cambridge. I am aware that it is increasingly the practice of professional men to give their

sons an University education ; and in some, though probably not in many instances, the practice has obtained amongst surveyors. No doubt, it has its advantages. The habits, manners, and associations are formed amongst gentlemen, many of them of the landed interest, whose acquaintance may be professionally useful in after life ; the surveyor's son may be a reading man, and may pass with honours the examinations for his degree,—a distinction which will give him a position in after life. But, on the other hand, the practice has its disadvantages. Several of the most precious years of the young man's life are spent in an education by no means specially adapted to his future profession,—years which he can ill spare, even for University advantages and honours. If he acquire the manners and tastes of gentlemen, he may also acquire the desultory and expensive habits, if not the vices, of too many of his associates ; and, instead of reading, he may waste his time in frivolity and dissipation. Even if he avoid these evils, the tastes and habits he will form will probably render the drudgery of a surveyor's office peculiarly distasteful to him. On the whole, then, I arrive at the conclusion that the balance is against an University education for the surveyor. I think, however, that the quality of his education should be put to a thorough test ; and with this view I would recommend that, on leaving school, he should pass the matriculation examination of the London University, which is of a severe and searching character, and is resorted to by young men from the best schools in England,—even by many who intend to pursue their studies at Oxford or Cambridge. Having thus matriculated, the young man need not as a matter of course continue his studies at the London University, though he can afterwards proceed to take his degree if he be so inclined. As an institution especially adapted for the education of surveyors, I may mention the Royal Agricultural College at Cirencester, where a good rudimentary

knowledge of geology, agricultural chemistry, and other kindred subjects may be obtained, which cannot fail to be a useful foundation for professional knowledge. The entire course of lectures at this institution occupies, I believe, about two years.

Let us now suppose the young man, of eighteen or nineteen years of age, about to enter on the task of acquiring a practical knowledge of the profession of a surveyor. I would mention, as a preliminary of more importance than is often attached to it, that of obtaining a good practical knowledge of accounts. This branch of a commercial education is wholly neglected in our classical and mathematical schools; and many boys enter upon their professional studies who scarcely understand an ordinary cash account, much less the mysteries of double entry, or the somewhat complicated bookkeeping of the farm or the estate. Yet a practical knowledge of accounts is as necessary to the land agent or farmer as to the merchant or tradesman. Without it, the land agent cannot present his annual accounts of a large estate to his employer, with that clear statement and analysis of receipts and expenditure, which will exhibit the general result at a glance, whilst it will account for every item in detail. Without this knowledge, too, the land agent must rely entirely upon his accountant; and honest as it is hoped and believed are the great majority of this class of persons, yet instances of dishonesty not unfrequently occur; and it is obvious that they are far more likely to occur when the accountant knows that his principal is ignorant of accounts, than in cases where he knows that his books will be periodically and strictly audited. This knowledge is also of great use to the land agent, who has to keep the accounts of a home farm, and to present a clear and detailed account of receipts and expenditure, and of profit and loss. I believe, that a few months spent in an accountant's office is the best mode of acquiring a sufficient

knowledge of accounts for these purposes, as well as those habits of neatness in handwriting and figures, which we all like to see in our account books, but which are not often learnt at school. If these objects can be thus obtained, I do not think the time thrown away.

I will now suppose the young surveyor, articulated as a pupil in one of our leading offices in town or country. On the use that he makes of the next few years will mainly depend his chances of success in his profession. He is pretty much his own master, and whether he acquires much knowledge or little will depend mainly upon himself. He will find the partners of the firm too much occupied in business and too much from home to be able to devote to him much personal attention. How then is he to acquire the theory and the practice of his profession? As for the theory, the surveyor's library is but scant, and there are no courses of lectures on professional subjects, as there are for the student of law or medicine; yet there are works which may be read with advantage, and as the time for reading, after office hours, is but limited, the pupil should devote himself to such a course of reading as bears directly upon his profession. Amongst these, I may mention, treatises on Geology, Botany, Agricultural Chemistry, Agriculture, Estate Management, Life Leases, Reversions, &c. I trust that one object to be kept in view by this Institution, will be the formation and selection of a professional library for the benefit of Members and students of the profession.

But it is on the practical knowledge to be obtained, by having what is sometimes called the run of the office, that the pupil must in great measure rely. And, here, I cannot too strongly impress upon him the fact, that much will depend upon himself. If he performs the duties assigned to him in a listless perfunctory manner, as a mere machine, not throwing his mind into his work, he will soon find that his employer will take little interest in him, that he will

not communicate his knowledge, and the pupil will, at length, leave the office without having acquired one-half the knowledge that he might have done; but if, on the other hand, he throws his mind into his work, and makes himself as useful as he possibly can, he will soon find that his employer will take special interest in him, that he will be glad to have his company on his journeys, when valuable opportunities will arise of acquiring knowledge of the business in hand. The pupil may thus become the confidential assistant, who may be trusted with the conduct of important details, and thus he may early acquire a practical knowledge, and a confidence in himself to be obtained in no other way.

The pupil will find the profession of which he has to make himself master divided into several branches, all more or less connected but diverse in character. These may be arranged under the following heads, viz. :—

1. Chain surveying, mapping, and levelling.
2. The valuation of land and other property.
3. The management of landed estates.
4. The improvement of landed estates, including land drainage, the erection of farm homesteads and cottages, and the laying out and disposal of building land.

And, 1st., as to chain surveying, mapping, &c. In the days of my pupilage, thirty years ago, this formed a large branch of business, to which the time of pupils was principally devoted. The surveys for the Tithe Commutation, then in progress, afforded full scope for employment in this important department, and the opportunity of acquiring, by practice, quickness and accuracy in the field. The completion of the tithe surveys, and the general adoption of the tithe maps, as the standard of measurement, have so far reduced the extent of this branch of business, that, except in offices that specially devote themselves to it, the pupil has now little opportunity for the study and practice of the art.

To acquire accuracy and speed requires several years' practice, and it is a question whether the pupil's time may not be better employed. Yet a knowledge of field work is very useful in after life, as it enables the surveyor to test the quality of the surveys made for him by those whom he may employ; and if the pupil have time and opportunity, he will do well to acquire it. A practical knowledge of levelling is absolutely necessary for the purposes of land drainage and irrigation, and should on no account be neglected.

I now come to the 2nd head—The Valuation of Land and other Property. To acquire an accurate knowledge of the value of land is, perhaps, the most important part of the surveyor's education, that in which he will find the greatest difficulty, and to which he must devote the most patient attention. During his pupilage he must expect to do little more than lay the foundation of that knowledge, which only long practice and experience can so far mature as to entitle him to the confidence of the public. But it is of the greatest importance that the foundation thus laid should be sound. Suppose the pupil placed in the office of an eminent judge of land. Let him embrace every opportunity of accompanying him in his valuations. Let him not rest satisfied with recording the field values, but let him enquire into the indications on which the judgment has been formed, and the reasons for the conclusions arrived at. Let him not, however, be a mere copyist, even of the most eminent master. Let him study the elements on which the value of land depends; let him classify the various descriptions of soils, according to the amount and description of produce, the course of husbandry, the expense of cultivation. Let him learn to assign the maximum and minimum values to each class of land, and to understand the reasons why these values are applicable. Let him minutely study the indi-

cations, both general and special, of fertility and barrenness in soils. On this subject I may mention, by the way, he will find an admirable paper by Mr. BRAVENDER, in the *Journal of the Royal Agricultural Society* (vol. 5), entitled "On the Indications of Barrenness and Fertility in Soils." Let him study the quality and description of herbage on grass land (here a knowledge of Botany will be found very useful), and the depth and texture of the soil and sub-soil of arable land. After all his pains he cannot reduce the science to a certainty, he must be content with an approximation. He will make many mistakes. Happy is the surveyor who can say that, in the course of a large practice, he has made but few !

The next branch of the profession to which I have to refer, is the Management of Landed Estates. Were one to judge of the management of landed property by the description of persons to whom it is to a large extent entrusted, one would be led to suppose that it requires no special training or qualifications whatever. By far the greater part, probably, of the landed property of England is under the management of Solicitors, who are usually little more than receivers, without much knowledge of the details of management. The stewardship is often given to a relation or personal friend of the landowner, not on account of the acquaintance with his duties, but as a means of affording him a livelihood. Military men are great favourites, though in what respect their previous habits have fitted them for estate management it is hard to understand. The fact is, the effects of good or bad management upon an estate are not all at once developed, and, therefore, good management is not always appreciated. But let not the young land agent think that he has nothing to learn. The more the details of estate management are examined, the more attention and skill will they be found to require. The fair rental of farms, the necessary

amount of capital, the choice of tenants, the covenants of leases, are all matters needing much judgment and knowledge. The oversight of the tenantry, too, as regards the management of their farms, and the fulfilment of their covenants, requires considerable tact, in order to exercise a firm authority, and to command the respect and good feeling of the tenants, without descending to a system of espionage or becoming too familiar with them. The oversight and management of repairs will be found to require much practical experience, and more study than is often devoted to it. The surveyor should acquire some knowledge of building and of measuring work, the quality and use of different kinds of materials, and the most economical mode of executing work. A large estate requires considerable administrative talent in the arrangement, and superintendence of the duties of subordinates and workmen. The care of woods and plantations also calls for much skill and attention, to develop the growth and to increase the annual produce. In fine, he may be described as a model land agent, who knows how to make the most of an estate without racking the rental, how to select and encourage good tenants, how to combine improvement with economy, and how to promote that mutual confidence between landlord and tenant which ought ever to exist on every well managed estate.

My fourth head, the Improvement of Landed Estates, is yearly becoming of more importance, owing to the increasing spirit of improvement which prevails. It is, therefore, worthy of the especial attention of the young surveyor. It is, however, a question for consideration how far this branch of the profession can be combined with general practice. Every surveyor ought to be well versed in the homestead requirements of farms of various extent and description, so as at least to be able to sketch the general plan of a homestead. But the detailed plans, working

drawings, specifications, and estimates require the knowledge of an architect,—a knowledge which needs as much time and attention to acquire as the general practice of the surveyor. Few can devote sufficient time to obtain a practical knowledge of both professions ; and I am, therefore, inclined to the opinion that the erection of farm homesteads must be regarded as a specialty, requiring a particular education distinct from that of the land agent and valuer. The same remark applies to the art of scientific land drainage, which in its highest sense requires special study, and is, perhaps, best carried on as a distinct practice.

I will now suppose the young surveyor to have spent three or four years as a pupil in an office of extensive practice ; that he has made the most of his time and advantages, and has acquired a fair knowledge of his profession. He should now make himself acquainted with the practical details of farming ; and, with this view, he should spend at least two years under the tuition of a first-class farmer, partly, perhaps, on a heavy and partly on a light soil. The knowledge thus acquired will be found of great value in after life. Without it, indeed, the surveyor, however competent in other respects, will find himself at a disadvantage, especially in his oversight of the farming of the tenantry on estates under his care, and in settling and discussing the covenants of leases.

Let not the surveyor who has gone through the whole of the training indicated in this Paper, and is now about to enter into practice, think that his education is complete. Perhaps there is no profession that depends so much upon a long course of practical experience for the attainment of a matured skill and judgment. The education of the surveyor must be lifelong. He must never be too old to learn, and to be conscious that he is liable to error. He who is most awake to the mistakes he has made will be most likely to avoid them in future ; whilst he who will never admit

that he is wrong will probably repeat his mistakes to the end of the chapter.

A mere knowledge, however, of the profession will not suffice to command success, unless accompanied by habits of business, knowledge of men, and tact and address in his intercourse with others. In these respects the surveyor must educate himself; without these qualifications a man of sound and varied knowledge may be beaten in the race by another of inferior acquirements who possesses them. If the surveyor would be a man of business, he must learn the art of executing whatever he has in hand with skill, decision, and despatch. Let him avoid those dilatory habits which have been the bane of some able men in the profession, and let him act upon the maxim,—never to put off till to-morrow what can be done to-day. He should also endeavour to acquire that business tact with which some men are naturally more gifted than others, and which mainly consists in a knowledge of men, and of the mode of so laying your views before them as to command their assent; or, in short, of saying the right thing, in the right way, and at the right time. The talent of administration is another point of great importance; without it, indeed, no large business can be properly carried on. It may be defined as the talent of so arranging the duties of the office as to get through the greatest amount of business with the least waste of power, and of so classifying the various departments under responsible heads, as to avoid confusion, and to relieve the principal of matters of detail. With some men this talent is a natural gift, and has contributed largely to their success in life; other men of undoubted talent and unwearied industry find that for want of it their business is always a burden, and always in arrear. If, therefore, the young surveyor have not the natural gift, let him spare no pains in its acquirement.

I will now add a few words on the moral principles

which should regulate the young surveyor's professional character. Let him be sure that in his profession, as well as in all others, "honesty is the best policy;" let all his transactions be marked by candour and straightforwardness; let no advantage in negotiation tempt him to swerve from the strict truth, and no zeal for the interest of his client induce him to descend to meanness or trickery in order to attain his end; in a word, let him never depart from that course of unimpeachable integrity without which even the highest talent and attainments will fail to command respect, or to place him in the first rank of the profession.

I append a few remarks as to the extent to which this Institution may render aid in promoting the education of the surveyor. The profession cannot expect, in the present day, to obtain from the Legislature any charter or peculiar privileges, such as those enjoyed by the professions of law and medicine. It will always remain open to all comers; and it will always be competent for any person to call himself a surveyor, whether educated for the profession or not, if he can only induce the public to place confidence in him. The policy of the Institution should, therefore, be to require a high standard of education, both general and special, as a qualification for Membership, in order that the fact of being a Member may be an earnest of superior competence and skill, as well as of good character. There will always be, as there are at present, especially in the country, men who, from long experience as practical farmers, have attained to a fair knowledge of the value of land—more particularly in their own localities—and the regularly trained surveyor must always expect to encounter competition from men of this class. Whilst it cannot be denied that amongst them are to be found some men of superior ability, yet, as a rule, they are deficient in general knowledge of the profession. The aim of the Institution should be to maintain a standard of Membership sufficiently high to ensure an average supe-

riority of its Members over other practitioners. In short, Membership should be considered a distinction, not only by the profession, but by the public at large.

The test of fitness for Membership must, however, be practical and not theoretical. I do not see it possible to institute an examination in professional knowledge, however desirable it may be thought by some. The only men in the profession, capable of conducting an examination are too much occupied to undertake so arduous a duty; and unless it were well done, it were better not to make the attempt. The test of fitness for Membership must therefore be found in evidence of practical competence and skill.

Although I do not think an examination practicable, yet I believe this Institution may in various ways, indirectly, promote the education of the surveyor. The establishment of a professional library would be a boon to students of the profession. The reading of papers on professional subjects, and the free discussion of them at the ordinary general meetings, would tend to throw new light on many subjects, now but imperfectly understood. To make these papers and discussions as generally useful as possible, both to town and country Members, a journal might be published and circulated, containing the various papers, with condensed reports of the discussions thereon. This journal might be made useful as a medium of correspondence, on the topics thus introduced, and as a channel for advertizing estates. Widely circulating among the profession, it might be made self-supporting.

I have endeavoured in this Paper to indicate, I fear but imperfectly, the course of training which appears to me to be the best calculated to fit the surveyor for his important duties, and the mode and extent to which this Institution can aid in promoting this object. If my remarks should prove of any value in advancing the education of our sons and of our pupils, I shall feel that I have contributed

some trifle towards one of the objects of this Institution—that of promoting the interests and raising the tone of the profession.

Mr. P. D. TUCKETT (Member), in rising to propose a cordial vote of thanks to Mr. STURGE for his very excellent and interesting Paper, begged to thank the President for giving him this opportunity of testifying, as he could do, to the entire competence of Mr. STURGE to deal with the subject he had treated of. It was now about nineteen years since he (Mr. TUCKETT) was articled to Mr. STURGE and his father, and he should always be impressed with the obligation he was under to that gentleman for having done so much more for him than masters were generally found to do for their pupils. It was very apparent to all who heard it that this Paper came from the heart; that it was the result of many years of reflection, and was prompted by an earnest desire to elevate the standard of education of the surveyor. It was impossible to refer to all the points touched upon in the Paper; but he thought there was one which had hardly been brought into sufficient prominence,—that was, the learning practical farming on a farm. He doubted whether the education given in Cirencester College ever became a substitute for that. He remembered, after he had served his articles, and hardly knew what was best to do with himself, he had accidentally an opportunity of consulting with the President, who insisted that there was one thing which a young surveyor ought to do,—that was, to make himself acquainted with practical farming on a farm. That advice had so strong an effect upon him that he immediately acted upon it; and he could say truly he never regretted the year of his life which was so spent, for he believed he had never gained so much useful professional knowledge, in so short a time, either before or since. He thought, perhaps, Mr. STURGE proposed to

devote too much time and attention to the actual study of accounts. Not because he did not doubt their absolute necessity, but he considered the practice so simple, that, with the exception of mere accountants' technicalities, he thought any one might learn how to keep accounts in a week ; and, as regards the balancing by double entry, &c., there were books on the subject which the pupil might read through in a couple of evenings, and if he would devote a very short time to the study, he ought to be master of the subject.

Mr. J. H. LLOYD (Associate of Council) had great pleasure in seconding the motion, because he had had the privilege, as he esteemed it, of knowing Mr. STURGE intimately for the last twenty years ; and, on the occasion of their first association, when they travelled together over a large area for the purpose of assessing compensation on a very important line of railway, Mr. STURGE impressed him with a sense of his great power and great ability, which longer acquaintance had only confirmed, and he was sure no member of the profession had its interests more sincerely at heart. That was indicated by the Paper which he had read this evening. The tone of it was high ; the principle was good. It was evident that he wished the surveyor to be something more than the ordinary hack which some supposed him to be. He wished him to be a gentleman, a man of honour, endowed with high principles, and, above all, having a perfect acquaintance with the matters appertaining to his profession. There were one or two points on which he rather differed from his friend. He thought the education he had suggested, or rather shadowed forth, was, perhaps, a little too exacting. It might not be possible for all persons to follow out that course. It assumed that a very large amount of time was to be devoted to preliminary study, and he feared it would be found

impossible for many men to arrive at that state of professional accomplishment which Mr. STURGE suggested, and which, perhaps, might be theoretically desirable. He thought practically they found a great many persons became accomplished surveyors without having passed through so elaborate a process of training. It was quite clear, however, that this Institution would afford great opportunities for much which had been suggested as necessary in the education of the surveyor. They would have a Library soon, he hoped, such as would enable young men to learn a great deal. He agreed with the preceding speaker that the keeping of accounts and the knowledge of figures was a matter of great importance, and although it would appear to be easily acquired, it was not so in fact. In his own experience he had found persons, otherwise highly educated, stupid about accounts beyond measure. Indeed it was astonishing to see the almost childish ignorance of accounts which one often met with, and yet there was nothing in which surveyors ought to be better versed in than accounts. But if one were to go into all the multifarious subjects which the surveyor ought to be acquainted with, the effect would be a conclusion that he must be the most accomplished man in the world. He was afraid they must lower their standard a little, and make the best they could of him by training, leaving the rest to be accomplished by practice and experience.

Mr. P. BADCOCK (Associate) remarked that, in the extensive practice of the President, in which he had assisted, he frequently met with men in large practice who had very little knowledge of mathematics, and he gave several instances of the absurd mistakes into which these gentlemen had fallen in calculations of the value of leaseholds, life interests, &c. ; and mentioned that, in the year 1851, Government introduced a bill to deal with ecclesiastical

property. That bill proposed terms for enfranchisement of leasehold property, which, in the opinion of competent persons, were very detrimental to the church revenues of the country. The bill was referred to a select committee, and owing chiefly to the evidence of Mr. E. J. SMITH, Mr. H. A. HUNT, and others, the Committee reported against it, and other terms were substituted. It had been estimated that if the principle of the Government scheme of 1851 had been adopted in the calculations, it would have resulted in a loss to the church of a million, or thereabouts, upon the transactions then carried out, which related to about one-third of the value of the leasehold property of the church, so that ultimately, the actual loss would have been about three millions. He thought that was sufficient evidence of the necessity for the education of surveyors in the science of figures and an instance of the large interests often at stake in the right application of its principles.

Mr. W. EVE (Member) said it was quite certain that, in the cases mentioned by the last speaker, the professional men first referred to were not pupils of Mr. STURGE. As to the Paper itself, he concurred with the opinion expressed by Mr. LLOYD, that it was expecting rather too much from surveyors. He was pleased to see that Mr. STURGE dropped Oxford for Cirencester; though he agreed that the education imparted at Cirencester was not sufficient for a land valuer. No doubt he might learn there the rudiments which a course of practice with a farmer might mature to his advantage. With regard to one point in education, which the author of the Paper mentioned, he could speak feelingly as to its importance,—that was, writing. He was a very bad writer himself; and in the earlier part of his career he felt that very sensibly, and he thought, in the education of the young surveyor, too great importance

could not be attached to writing. With regard to the valuation of land, there were one or two important things to which Mr. STURGE had not alluded, viz.,—position, size of fields, and access. These three things should never be lost sight of in any dealings with landed property, and he thought they were underrated by most valuers.

Mr. THOMAS HUSKINSON (Member) said it would be ungracious to offer anything like criticism on the Paper, and he hoped the few remarks he offered would not be understood in that sense; at the same time he did not quite agree with the author on the question of farm buildings. Mr. STURGE seemed to think that the planning of farm buildings was not within the proper limits of the surveyor's practice, but rather belonged to the province of the architect. He (Mr. HUSKINSON) thought, with regard to every building, the question of arrangement, the kind of building required, and the conveniences to be provided, came more especially within the province of the land agent than that of the architect. He held that the architect's duties were of a higher and different order. With regard to the question of education generally, these points struck him, viz.:—how far it should be considered technical and how far general. The question which evidently presented itself to Mr. STURGE was that it should be, to a large extent, of a technical kind, which involved, he thought, more time than most people could give before commencing practice; at the same time much was required beyond the technical education of the profession. He thought education might be summed up in the idea which was expressed by Lord GRANVILLE, when he said—"a man should know everything about one thing, and as much as he could about everything;" that is—to know all he can about the special subject of his own calling, and, at the same time, acquire as much general knowledge as he could. They knew that knowledge did

not run in parallel lines, but as branches from one stem; at the same time, there was unity of knowledge; and, besides technical knowledge, a general knowledge of the conduct of business was of infinite value. He placed that even above an excess of technical knowledge. He would have them know technically how things could be done, and then leave it to technical men to carry them out. In addition to being able to form accurate opinions themselves, it was necessary to possess tact, so as to bring others to conform to those opinions. A great writer, two hundred years ago, said that the art of negotiating in business had never been reduced to method or rule. They might say the same at the present time; but the fact of its not being reduced to method showed, not only how difficult, but how impossible it was to do so. It could only be learnt in the school of practice. It required an intimate knowledge of human nature. They must apply the rule laid down by Solomon, they must "deal with fools according to their folly," and not as it appeared to themselves; and, also, not "to answer a fool or to be like unto him," but rather to endeavour to bring his ideas into conformity with their own. It was the tact and ability of convincing those with whom they had to deal which was the highest, and at the same time, the most important branch of the surveyor's education.

Mr. STURGE said it was a peculiar pleasure to him to have a vote of thanks proposed by the only pupil he ever had in his life; it was a peculiar pleasure also to have had that vote seconded by Mr. LLOYD, with whom he had been so long acquainted, and under the lash of whose cross-examination he had occasionally come. One or two subjects had been referred to by the gentlemen who had spoken, to which he would briefly advert. First, as to the subject of accounts. His former pupil did not seem to have had any difficulty in the matter. There were some men who

saw through an account at a glance ; but, according to his own experience, for one man who understood accounts, there were half-a-dozen who did not ; and he believed it was a matter of great importance to understand accounts better than he thought surveyors generally did. Certainly they were better understood in mercantile than in professional offices, and to the great advantage of the former. He never intended to substitute the education of Cirencester College for education in practical farming. He believed an education in practical farming to be most necessary for a land surveyor ; and he suggested, in his Paper, that pupils of the profession should spend, if possible, at least two years upon a farm. His view with regard to Cirencester College was rather in relation to that scientific knowledge which was not so necessary twenty or thirty years ago as it is now. He thought Mr. HUSKINSON, on one point, rather misunderstood his views. He (Mr. STURGE) stated that every surveyor ought to be acquainted with the homestead requirements of a farm, and be able to plan them ; but the details and estimates of the same, he thought, came more properly within the province of the architect. In his own practice he always gave a sketch of what he wanted, and asked for detailed plans in accordance. He did not think that, as a general rule, men were found to be competent in both professions at once.

The PRESIDENT, in closing the discussion, said he would state the result of his own experience, and, as Chairman this evening, he thought he might assume he had gained a certain position in his profession. He would tell them how that came about. He was brought up on his father's farm, under the care of his brother Robert, who was educated as a chain surveyor : he (the PRESIDENT) was not ; and, for ten years of his life, he did little else than attend to the farm, value timber, and look generally after the estates in

the neighbourhood, to which his father's practice was principally confined ; and his own impression was that a young man, who was intended for a land surveyor, should first gain a practical knowledge of the farm before going into the office. The practice of an office ought to be very regular : that of the farm was not regular ; and he held that the practical farming knowledge should be the primary one, because the pupil could not appreciate the greater part of the work he had to do in the office unless he had acquired a practical knowledge of farming. No one, by the performance of his duties in the office, could acquire a knowledge of agriculture. He might go over estates, make maps, and be able to do office work ; but it was impossible to acquire a knowledge of land so accurately as by going on the farm and doing the work of the farm. He had done, with his own hands, every description of work that the farmer was competent or required to do ; and he believed it was his personal knowledge of the practice of the farm which had placed him, to some extent, in the position he now occupied. And, he would observe, it was just the same, so far as his experience went, with respect to the building surveyor. Those men who had the most thorough grounding in measurement, and taking out the quantities, were now the most eminent as valuers of building property. It was the same with many architects. Probably, those men who were educated in the workshop to a limited extent were, on the whole, the most practical architects, and the men who had executed the most practical buildings. He, therefore, thought before a young man went into the office he should go on the farm, and before going into the office of a valuer of buildings he should go into the practical measuring surveyor's office. He did not know that he quite agreed with Mr. STURGE on the matter of education, as he had seen men who had taken the highest University honours make the most practical surveyors. His own experience led him to say the better a man's education

was, the better position he took in any profession to which he aspired. He confessed he hoped this Institution would lead men to be better educated than before. That was not casting reflection upon any of the present Members. He thought Mr. HUSKINSON and the author of the Paper were practically agreed upon the subject of farm premises. He believed himself the requirements should be in the hands of the surveyor ; but the mode of carrying out should be left to the architect. He remembered being called on to report to the Court of Chancery upon some farm premises in Hertfordshire ; he found the value of the farm to let was £150 a year, which at thirty years' purchase would be £4500. A London architect proposed to expend £5000 on farm buildings, or more than the whole fee simple of the estate. He thought, further, there was an advantage in the student going into the office of a surveyor in the country, before going into that of a practitioner in London. There were many branches of business which, as a rule, London surveyors did not generally much understand. One of these was the valuation of farm produce ; and he asked any surveyor how he could well ascertain what the value of land was, without being able to say what the stock on the land should be, or what the value of that stock, and what the land was likely to produce. In all these matters the country practitioner had the advantage. He, therefore, advised the young surveyor to acquire a knowledge of the practice of the country surveyor after he had obtained the practical education of the farm. He had seen good men come out of Cirencester, and he thought it was a good training for young men to get a general knowledge of chemistry and the other sciences taught there, but that it was not the place to acquire a knowledge of practical farming.

ARTERIAL AND AGRICULTURAL DISTRICT DRAINAGE,

AND THE
LAWS CONNECTED THEREWITH.

BY
RICHARD BOXALL GRANTHAM, C.E., ASSOCIATE.

*Read at the Ordinary General Meeting of the INSTITUTION OF
SURVEYORS, January 11th, 1869.*

THE PRESIDENT IN THE CHAIR.

THE term "arterial" has been applied to the rivers and streams of a country in consequence of their similarity to the arteries for conveying the blood through the body, and the appearances of a map and of a drawing of the arteries of the body are precisely the same.

In this Paper it is proposed to advocate the principles of arterial drainage by pointing out the great benefits that would ensue from a more extensive adoption of the system, and by giving an account of the results in those cases where some combined systems or district drainages have been carried out.

Before an Institution consisting, as this does, of persons practically acquainted with the management of land, and who are fully alive to the improvement of which it is often capable, by the application of engineering works, it would seem unnecessary to occupy time in discussing questions so familiar to them. Nevertheless, as an Inspector under "The Land Drainage Act of 1861," having a better opportunity of forming an acquaintance with the subject, perhaps, than most persons, I have found that the advantages of such

works, particularly in some parts of England, are not appreciated as they ought to be, and I hope that the influence and intelligent spirit of the Members will be exerted to recommend the adoption of the facilities offered by this Act. As an illustration of the works that have been carried out in training and forming the courses of rivers through marsh lands we need only refer to the fens in the counties of Lincoln, Cambridge, and Norfolk, to understand what can be done by combined systems of drainage in reclaiming land, and in preparing it for cultivation.

The necessity for district systems of arterial drainage has, it is well known, arisen from the great increase of pipe drainage, and the better clearing and opening of ditches and drains of late years, thereby causing a more rapid and an increasing discharge of water from the uplands into the valleys, and overloading the rivers and streams, so flooding them more frequently, and to a larger extent, than was experienced in former times; besides which, those valley lands being subject to floods, or the water constantly lying within a few inches of the surface, have their crops frequently destroyed, and are available as pastures for a much shorter period in each year than they really ought to be.

The difficulties that formerly arose, from the state of the law, in constituting any combined action to remove obstructions in rivers, to deepen, straighten, and improve them, and to form proper outfalls through the lands of hostile owners, or of those who were indifferent to the improvement of their own land, or unwilling to give facilities to others, have been, to some extent, removed by an alteration and extension of the powers of the old Sewers' laws.

I read a Paper on "Arterial Drainage and Outfalls," at the Institution of Civil Engineers, in 1859-60, after which Sir GEORGE CORNEWALL LEWIS, then at the Home Office, prepared a Bill extending the powers of the laws

relating to the Commissions of Sewers. In 1861, the Act called "The Land Drainage Act" was passed. The main features of that Act are that it enables Commissions of Sewers or District Drainage Boards, as the promoters may elect, to be formed in river valleys or in marsh and low lands by those who may be interested in them, by combining under either of the above forms to carry out works in making new watercourses and improving rivers, with the necessary outfalls, and to tax the lands benefited by these means within a properly defined jurisdiction, sanctioned by the Inclosure Commissioners; but extending into valleys in the interior, and not limited to the area marked out by the level of the tides, as the old Commissions are; and it provides for the reclamation of land from the sea, irrigation, &c.

The Honorary Secretary has prepared an abstract of the Act, which will be found in the Appendix to this Paper.

Mr. THEODORE THRING has published a manual of the Act, which I beg to recommend to any one who wishes to be informed of its powers.

The number of cases under the Act amount to 22, of which I have inspected 21, and the districts comprise in all about 70,600 acres.

The following is a list of the districts which have been formed :—

	Acres.		Acres.
Morden Carrs, Durham	4,000	Dysynny, Merioneth	2,564
Wormbrook, Hereford.	1,977½	Staunton Common, Here-	
Wissey, Norfolk	8,240½	ford	1,454
Ladden Brook, Gloucester	957	Winterton, Norfolk	1,055
Longdon and Eldersfield,		Chedzoy, Somerset	2,412½
Worcester	3,595	King's Sedgmoor, Somerset	11,259
Llangorse, Brecon	1,085½	Frodsham, Cheshire	4,217
Maxey, Northampton	7,918	Northmoor, Oxford	2,364
Martham, Norfolk.	591½	North Moor, Somerset	3,235
River Idle, Nottingham	6,000	Aller Moor, Somerset	2,155½
Stanmoor, Somerset	676½	Haddiscoe, Norfolk	1,628
Currymoor, Somerset	1,820	Muckfleet, Norfolk	4,140

Some of these have been carried out most successfully, and others are in progress, and some have not been commenced. The areas of each district vary, as will be seen, from 591 to 11,259 acres.

The cost of putting the powers of the Act into operation has been, on an average, £50 in each case.

I do not know that I can illustrate the subject better than by describing the practical results of different methods of carrying out a combined system of arterial drainage. For this purpose, I have selected a district drained by gravitation; another by means of pumping; and a private drainage, also by pumping.

The first is that of the Leadon, which is a river rising in Herefordshire and Worcestershire, with a watershed of about 120 square miles. The district was formed under a Commission of Sewers in 1861; and the works, which are confined to the jurisdiction, were completed, as far as they could be then executed, in 1867. The Commissioners, in order to inform those who are interested in the improvement, lately published a statement of their proceedings, with an account of the expenditure, which I have added to this Paper as an Appendix.

The account shows the total expenditure; but it should be remarked that the purchase of the water rights and compensations absorbed more than half of it.

The Leadon flows into the western branch of the river Severn, about a mile and a half from Gloucester. There were formerly two mills upon it—one, the Over Mill at the Severn, and the other, Rudford Mill, about $2\frac{1}{2}$ miles above it—by which the water was penned back for upwards of 5 miles. The water power of both mills was purchased by the Commissioners, who were thus enabled to deepen, widen, and straighten the river where requisite; and the effect has been to lower the water towards the outfall

5 feet, and at the upper end 4 feet. The jurisdiction of the Commissioners, which includes a branch river in the parish of Tibberton, extends over about 1,400 acres.

From the Severn to the archway under the Hereford and Gloucester Canal, which is $4\frac{3}{4}$ miles, the work consisted for the greater part of a new cut, and the remainder in deepening and taking off bends only. Both sides of the new river, for a mile and a half in length up from the Severn, as well as along the bank parallel to the Severn, were embanked, to keep out the tides and the flood-waters of that river, and also to confine the floods of the Leadon itself, which flow down from the upper country about two days before those of the Severn arrive at the same point. From the Hereford and Gloucester Canal through Tibberton parish, being about $1\frac{1}{4}$ miles, the brook was deepened and widened in places, and in others the banks were dressed off and the bushes cleared. From about the fourth mile on the main river it was deepened, cleared of bushes and weeds, and the banks dressed off for about 2 miles, making altogether nearly 7 miles,—the cost of which amounted to about £3,070, including superintendence. The remainder of the outlay was for obtaining the Commission, raising money, office and legal expenses, &c. The money has been borrowed, and will be paid off in twenty-five years. The rate for the repayment of this and interest, together with the annual expense of clerk, varies from 9s. to 11s. per acre, assessed upon the land according to the benefit conferred. For the first two years after completion of the main cuts for the river, the repairs and clearing the bottom and sides cost only £10. The practical result has been that the floods caused by the river Leadon have not overflowed its new channel, and the floods and tides of the Severn itself have been so confined within its own banks as to prevent them overflowing the adjoining land, and their duration

is very much reduced. The floods have never since injured the growing grass, nor carried it away when cut, as was formerly the case in about one year out of four. The quality of the grass is very much improved, and cattle and sheep can remain on the pastures nearly all the year. The under-drainage can be better carried out, and the river is as nearly as possible under the control of those who are interested in its proper action. To conclude the description of this work, I cannot do better than quote a letter written to me by Mr. WILLIAM P. PRICE, the Member for Gloucester and Chairman of the Leadon Commission, who lives in the neighbourhood, and has a large area of land within the jurisdiction :—

“November 29th, 1868.

“My dear Sir,

“The result of our Leadon drainage may be stated in a very few words.

“We can now drain effectually all the lower level, which we could not have done before; and the floods are much fewer in number, and when they come do not hurt us, because they are off again directly.

“The drainage has done all I ever expected of it.

“It is difficult to speak of the commercial value. The rates may be taken to be about 7*s.* 6*d.* per acre, putting the rest for redemption of capital outlay. Is the improvement worth this 7*s.* 6*d.* to the tenant?

“In the first place, I don’t think any one of them denies it. But if they did, I should not believe them.

“In the second place, one hay crop saved in every four years would pay it for them: and summer floods destroyed the crops at least once in four years.

“But, apart from this, we can now keep cattle in the land *always*, except during the very short duration of a

flood, which we rarely experience now, except when the cattle are all in the folds.

“Yours very truly,

(Signed) “W. P. PRICE.”

NOTE.—The average cost per acre which Mr. PRICE refers to is that which is chargeable to the tenant, being the interest, the landlord generally paying the difference, which is the redemption of capital outlay.

The next case which I propose to describe is that of a district in Norfolk, in the parishes of Winterton and Somerton, about 10 miles north of Yarmouth, and which is drained by pumping. This district, containing about 1,100 acres, is comprised within a watershed of about 2,500 acres, and lies in a basin, formed by high land on the south side, and bounded on the west and north sides by Martham Broad, or Lake, and the Hundred Stream, the levels of which are from 3 to 4 feet above the area; on the east side are sand hills on the sea shore.

The soil at the eastern side consists of sand, yielding much water from the sand hills; it then, as we proceed westward, becomes peat of some depth in places below the bottoms of the drains; farther west still, the clay locally called ooze, or boulder clay, underlies the peat, and appears on the surface; and then, at the extreme west, there is peat again to a small extent.

The land, previous to the formation of the Commission, was drained by a windmill, driving a scoop wheel, which was destroyed in a gale of wind; and also by a small steam engine, driving another scoop wheel, which was too small by itself to drain the lands.

The area was, in fact, a marsh: for, although the wheels lifted the water out, floods occurred, and the drains were seldom free from water, the level of which was within about

2 feet of the surface of the land, which produced little more than rushes and water-weeds, and cattle could remain on the lands a few months only, even if the weather was fine. The marsh lands are generally let with the uplands in proportion to their extent, and, therefore, no definite rental is charged upon them exclusively; but I have always considered that an average of 10s. per acre was as much as they were worth. In 1864, a Commission of Sewers, under the "Land Drainage Act," was issued, called the "Winterton and Somerton Commission of Sewers."

The object of the work was to collect the water by a main leading drain at one point, from which it could be pumped into the Martham Broad, or Lake, a lift of 5 to 7 feet; and, in 1865, an Appold pump, worked by steam, was erected for this purpose.

It should be mentioned that the natural fall of the country was towards the sea, and that the Hundred Stream formerly discharged itself into the sea, through what are now high hills of sand, so that the drainage of the eastern portion has been diverted westerly against its natural direction; and it was therefore necessary to cut the drains through a summit in the district to make the water flow to the pump, which caused deeper cutting for the drains than would otherwise have been required. The different parts of the work were done by contract, they were completed in July 1866, and the following is a summary of the cost:—

	£
Earthworks	1,422
Pump and Engines	1,304
Bridges and Culverts	512
Engine House	526
Engineering and other costs . .	428
	£4,192

There are other items of expense, the amounts of which I am not acquainted with, but I consider that the whole cost has not much exceeded £4,500, or about £4 per acre. At first, owing to the land having been for all time full of water, and several springs existing, which came from the northern high land and sand hills, frequent pumping was necessary to keep the water in the drains low; but the subsidence of the peat lands, and the draining kept up by the pump, have very considerably reduced the necessity for its use. The rate, including the repayment of the borrowed money, is about 8s. per acre. In this case the rate is levied equally on the acreage, and not in proportion to the benefit conferred.

A great part of the area has been ploughed up, and the remainder has become firm pasture, which, in the course of time, will be improved by the disappearance of rushes, flags, and water-weeds. The nearest value that I can arrive at is, that the parts which have been wholly reclaimed are worth, to rent, 30s. per acre, and the remainder, £2 per acre at the present time; and this value will doubtless increase.

The next case of arterial drainage is a small one on some property belonging to a private owner at Hemesby, in Norfolk, not far south of the last case of Winterton and Somerton. The estate is on the borders of Ormesby Broad, which it touches in two places.

Ormesby "Broad" is one of those singular lakes, or natural bodies of water, which are frequent in that part of Norfolk. In connection with two others, it contains between 400 and 500 acres of water.

The works consist of two drains leading from the north and from the south respectively, to a central point, where the pump is placed, and by which the water is lifted, and discharged through an open channel into the Broad. Banks

have been erected to keep the water of the Broad from flowing over the lowlands on its borders as it formerly did. The object is to reclaim about 150 acres in the two parts of the estate, which in winter are covered with water, and at other times are so low and damp as to be in reality permanent marshes. The drainage will also enable the proprietor to underdrain about 100 acres more land, and otherwise improve his estate. The works have but recently been completed, so that the value of the improvement cannot be estimated. The cost has been about £1,550. The drainage is completely successful, and the water is easily discharged; but, like all these cases, more pumping is necessary at first, where the land has been saturated for all time, than will hereafter be required.

I may mention a striking case of increased value effected by the system of pumping,—that of the marshes, containing about 700 acres of land, belonging to the Corporation and Freemen of Beccles, in Suffolk. These marshes used to be let at 14s. per acre, and grew little besides rushes, reeds, flags, &c. About ten years ago, an Appold pump was erected at the river Waveney, the drains were deepened, and the water lifted into that river, which is about 4 feet above the marshes. They are now let for 50s. per acre, and at the last letting, which ~~is~~ done by putting them up to auction, parts of them let for £3 per acre. The cost of the engine and pump was about £2,000.

There have been altogether four districts formed under the “Land Drainage Act” in these parts of Suffolk and Norfolk, and others are contemplated, I believe, in consequence of the success that has hitherto attended those cases which have been completed; and there are vast tracts that may be improved by the same means in that country.

I will refer briefly to some drainage districts which have been formed in Somersetshire, and were all formerly under

the "Somersetshire Commission of Sewers," parts remaining so still; but six districts have already been taken out of its jurisdiction, and a meeting for another case will shortly be held. All these districts are in the watershed of the river Parrett, comprising 635 square miles, and bordering upon that river, and they are all, with the exception of the King's Sedgmoor district, drained by Appold pumps into it. I have alluded to these cases because they comprise the greatest number that have been formed in any one locality under the new law, and each one has been undertaken from the example which has been given of the advantages of the preceding ones.

I am not able to state the cost of each case, or the commercial benefits that have resulted; but I hear that they are highly satisfactory.

The question will some day arise as to how we are to deal with the main arterial rivers of the country which are circumstanced as the Parrett is, with several districts discharging into it, both by pumping and training of rivers and streams.

The "Land Drainage Act, 1861," has hitherto not been applied so extensively as might have been expected, considering the great scope of its powers, and the advantages which result from them if properly called into action. It is, doubtless, well known to you that the old sewers' laws could not be made available for the improving and advancing the interests of agriculture in the present times. They certainly impose but light burthens upon lands by way of rates; but the powers are so restricted, the jurisdictions are so undefined, and the governing bodies so varying and irresponsible, and, generally, unconcerned, that they are almost useless for the exercise of extended operations.

But the "Land Drainage Act, 1861," requires amendment in some particulars, with the addition of provisions to

make it more applicable to the purposes of agriculture, and that only. The old sewers' laws are applicable, as far as they go, both to the drainage of towns, and of agricultural districts: for it was not contemplated, when they were framed, that any distinction between the two would have been necessary; but, of late years, towns and populous districts have well-defined laws of their own, applied under the sanction of a department of the Government, by which the mode of proceeding and method of rating are regulated, and other useful provisions are exercised; but the legislation for agricultural drainage purposes is surrounded by great difficulties and uncertainty; in fact, well-defined provisions are required for many purposes, and the chief of these is the mode of rating, in which there exists much doubt and difficulty. In my experience of this question of rating I have met with a great variety in the practice and opinions of the several valuers with whom I have come in contact: one has adopted the poor rate as the basis of the rate; another, an equal acreage rate; and one or two, a rate according to the benefit conferred;—cases of appeal to Quarter Sessions have been referred to me;—but I think there ought to be a special rule for this kind of rating. The only Act which in any way refers to this question is the 4 & 5 Vict., cap. 45 (which was merely an Amendment Act of 3 & 4 Wm. IV., cap. 22); but in so indefinite a manner as to throw doubt upon it. The correct principle, in my opinion, is that it should be in proportion to the benefit conferred on the various lands by the works, and in Ireland, where the question of drainage and rating is unclogged by sewers' laws, the matter is better understood; and, at the time of the famine in 1847, when large arterial works were carried out, they adopted such a system, which is illustrated in the following table:—

Name of Drainage District.	Area of Lands Drained or Improved.			Total Cost.			Original Annual Value of Lands Drained or Improved.			Increase in the original Annual Value of Lands Drained or Improved.			Cost of Works per Acre.			Annual Charge per Acre of Principal and Interest.		
	A.	R.	P.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
District of the Blackwater in the } Counties of Meath and Kildare }	3,827	2	18	12,115	16	6	2,119	1	8	1,084	7	9	3	3	3	0	4	0
District of Lough Neagh, in the } Counties of Antrim, Armagh, } Down, Londonderry, & Tyrone }	29,625	1	24	156,277	14	10	25,656	2	5	9,953	17	7	5	5	6	0	6	0
District of Oranhill, in the } County of Galway . . . }	974	0	16	3,871	16	2	260	12	5	315	10	1	3	19	6	0	5	9

There is another important question, and that is the power and the means of taking land for new works, or removing mills and obstructions in rivers; but the regulations laid down in the law are most cumbersome and uncertain. There are many other matters, which it would be tedious to enumerate, each requiring amendment; and I am in hopes that in the next Session of Parliament, an enquiry will be instituted into all the laws relating to drainage, and that we shall have a well defined and simple system of law established expressly for agricultural, arterial, and outfall drainage.

It would be very desirable to include, in any new Act, provisions for irrigation and storage of water, so that they might be either conjoined with or separated from drainage districts; and powers to charge either water rates or rents according to the systems adopted. The system of irrigation is extensively carried out in France, in the districts of Alpes-Maritimes, Haute-Garonne, and Basses-Pyrénées; in Spain, in those of the Canal de Esla, Canal de Henares, and Canal de Logrono; and in Italy, at Milan, &c.

In conclusion, I have only to say, my apology for thus occupying your time must be, that the several questions I have touched upon are most important, and are just those which the Members of this Institution can both appreciate and assist in solving; and I would further ask that you will give them your best consideration, so that, by your influence and advice, any future legislation on this special subject may be as comprehensive and complete as possible, and be confined exclusively to the great and increasing interests of agriculture.

APPENDIX.

THE LEADON VALLEY, IN THE COUNTY OF GLOUCESTER.

COMMISSION OF SEWERS.

RECEIPTS.		EXPENDITURE.	
£	s. d.	£	s. d.
Sums borrowed of the Land Securities Company on security of the Rates:—		For obtaining the Commission, Survey, &c. ..	
1st Loan	£7350 0 0	For the Water Power of Over and Rudford Mills, and for expenses incident to the purchases ..	493 6 3
2nd Loan	650 0 0	For Land and Compensation to Tenants	4636 15 6
		For Works—William Lee, contract and extras	137 14 0
Sums borrowed of Wm. P. Price and Wm. Viner Ellis, Esqres., on security of the Rates ..	8000 0 0	Thomas Clark, for day work	£1373 8 4
Received of Hereford and Gloucester Canal Company, for repairing Slip in Canal Bank	1500 0 0	Materials and sundries	1180 6 2
Received of T. G. Parry, Esq., one year's Rent for use of Water in Over Mill Pond, to March 1866, (before Rates were levied)	20 0 0		60 18 3
		For Interest on Money advanced by Bankers	369 15 8
	5 0 0	Commission on Loan of £8000 paid to Land Securities Company Lim. ..	382 10 0
		For Clerk's Salary, three years to time of Rating	75 0 0
		Advertising, Legal Expenses, and Management	232 18 3
			307 18 3
		For Engineer's Expenses	406 10 0
		Surveyor's ditto	49 10 0
		By Balance in Treasurer's hands	456 0 0
			126 7 7
			£9525 0 0

*An Abstract of "The Land Drainage Act, 1861," prepared
by J. W. PENFOLD, Honorary Secretary.*

The Act is divided into three parts :—

*I.—Commissions of Sewers. II.—Elective Drainage Districts.
III.—The right of private Owners to procure Outfalls.*

I. As to Commissions of Sewers.—The owners of one-tenth part of the land within a proposed district may petition the Inclosure Commissioners, who, after sending an Inspector to hold an inquiry, may on his report recommend Her Majesty to issue a Commission, provided notice of objection be not received from the owners of one-third part of the land proposed to be included, in which case, the petition is dismissed. The petitioners give security for costs, which are charged on the rates, if the petition be successful. A Commission once issued continues during the pleasure of Her Majesty, who may fill up any vacancies.

The powers of the Commissioners extend to the maintenance and improvement of existing works and the construction of new works, full compensation being paid for all injury. A mill-dam or weir may not be interfered with until the justices, or an arbitrator at the option of the owner, have decided—1st, that such interference is necessary for effectual drainage of the district; 2nd, that any injury can be fully compensated for by money.

"*The Lands Clauses Consolidation Act*," with certain modifications, is incorporated; but lands cannot be taken otherwise than by agreement without the sanction of Parliament, obtained in the following manner:—Notices, describing the works and the lands required, to be inserted in the *London Gazette*, and for three weeks in a local paper, and served on all owners, lessees, and occupiers. A petition is then presented to the Inclosure Commissioners, who, after an inquiry may, if they think fit, issue a provisional order for the exercise of compulsory powers. This order, however, is invalid until confirmed by an Act, which the Inclosure Commissioners take steps to obtain.

Two months' notice, of any proposed new works or improvements estimated to cost more than £1,000, must be given to all owners of the area liable to be rated, and they cannot be undertaken if the owners of more than half such area dissent.

The Commissioners may commute with any owner by gross or annual charge on his lands his liability to the repair of a sea wall, sewer, &c.

A rate levied to pay for works costing more than £1,000 is deemed a special rate, and a tax on the owner. If the owner make default, the rate is recoverable from the occupier, who may deduct it from his rent. All rates, except special rates, are payable by the same persons in respect of the same property, and recoverable in like manner as by law they now are. Commissioners may take a copy of the poor rate for assessing the sewers' rate. Money may be borrowed on the security of the rates with sanction of the Inclosure Commissioners. Persons aggrieved by any order or rate may appeal to Quarter Sessions within four months. If the ground of appeal is on matters of account,

or engineering, or scientific questions, the Court may order it to be referred to arbitration. Commissioners may not interfere with any drainage works authorized by Act of Parliament, or any navigation, dock, harbour, &c., or any waterworks, so as to injuriously affect the same. Penalties for persons polluting the watercourses, &c., of the Commissioners without consent. Adjoining Commissioners or Boards may enter into mutual arrangement for executing works. Commissioners or Boards may, with consent of Inclosure Commissioners, alter the boundary of counties, parishes, &c., by straightening watercourses, and advertizing alteration in *London Gazette*.

II. *Elective Drainage Districts*.—The owners of not less than one-tenth part of any area requiring a combined system of drainage, and not included in any Commission or Local Board, &c., may petition the Inclosure Commissioners, and (the owners of two-thirds of the area assenting) may obtain a provisional order constituting a drainage district on the same terms as above described for a Commission. Such order is not valid until confirmed by an Act of Parliament. The first members of the Board are named, and their number and qualification are fixed in the order. The Board, thereafter, is elected annually, all members are eligible for re-election, and the electors are the persons rated to the sewers' rate, with votes according to a scale. A rateable value of less than £50 giving one vote, and £1,000 and upwards, ten votes. The powers of a Drainage Board are the same as those of a Commission.

III. *The Right of Private Owners to procure Outfalls*.—Any person wishing to drain his own land, may serve a notice on the owners and occupiers of adjoining land, describing the works required on their lands, and stating the compensation proposed to be paid. Adjoining owner may by deed assent on such terms as he may think fit. Such assent is binding on all parties having any interest in the land. An owner under disability must obtain the approval of two surveyors to any arrangement, and the compensation is applied as pointed out in The Lands Clauses Consolidation Act. The compensation to occupiers, &c., to be settled as provided in that Act. Assent of adjoining owner to be recorded by Clerk of Peace.

If adjoining owner dissent, the justices, or an arbitrator at option of adjoining owner, are to decide—1st, whether proposed works will cause any injury; 2nd, whether such injury can be fully compensated by money. If no injury, applicant may proceed forthwith; if injury, they are to assess compensation, and on payment applicant may proceed; if injury cannot be compensated by money, applicant is not entitled to execute the works proposed. Applicant to pay all reasonable costs of adjoining owner. Adjoining owner may at any time alter or divert drains so made through his land, first laying down efficient drains in lieu thereof. Any dispute as to efficiency to be decided by justices.

Any person desirous of constructing a drain, whereby any brook, &c., will be diverted from its ordinary channel into any other brook, &c., must give notice in local paper, and serve notices with maps on all owners abutting on the brook, within four miles of the point of junction, and any such owner, dissenting, is entitled to the same rights as the adjoining owner above mentioned.

Mr. F. J. CLARK (Member), by permission of the President, referring to Mr. STURGE'S Paper "On the Education of the Surveyor," wished to say it appeared to him, that the education proposed seemed almost to preclude a man from practically entering into business till he was 27 or 28 years old. A friend had informed him that the value of land in England, at this moment, exceeded one thousand millions of money; that the houses, coal mines, and other incidents arising from that land, are of the value of a thousand millions more—he believed, practically, it amounted to fifteen hundred millions. He called attention to this, because many a young man with that standard of education before him might be deterred from attempting to become a surveyor. But these statistics disclosed such a wide and ample field for the surveyor, that he was sure the most humble of their fellows might find a sphere of usefulness and advantage, and hope to rise to great eminence, even among those who had greater culture, and had studied the subject as deeply as Mr. STURGE himself had done.

Mr. EDWARD RYDE (Member) rose to propose a vote of thanks. He said, it appeared to him that Mr. GRANTHAM was exactly one of a class of Members to whom the Institution would be deeply indebted if they would write and read Papers. Mr. GRANTHAM was a practical man, and his Paper related to a practical subject. There must be a large number of practical men in the Institution, and if they would follow Mr. GRANTHAM'S example, it would be greatly to the benefit of all. One fact was worth many arguments and theories. For example, Mr. CLARK had said, in reference to another subject, that a man, to come up to the standard of education suggested by Mr. STURGE could not practise as a surveyor till he was 27 or 28 years of age.

He did not know whether Mr. STURGE's Paper went to that extent; but perhaps he might be allowed to mention, in illustration, that he was himself in practice as a surveyor in London, with a fair share of business, before he was 24 years old. Experience was, after all, the principal thing. With regard to the Papers read here, he apprehended that the discussion which followed would probably be as valuable to the Members as the Papers themselves, because more information was often elicited than was originally given in the Paper. The first thing which it appeared to him desirable for Members to know, was the mode in which the Act of Parliament referred to could be put into operation. Not to take them far from London, he would refer to the district lying between Malden and Barnes Green, as being one of the worst drained localities to be found within the same distance from London. This arose, probably, from the want of application of such an Act of Parliament. He would be glad to hear how this Act could be put in force so as to effect the drainage of what was, for drainage purposes, called "The Cheam Valley," and whether it could be applied to such a case as that. He gathered, from what had been stated, as to the cost of carrying out the Act, that the tenants were paying in one district 7s. 6d. per acre, in addition to what was paid by the landlords. The actual cost would be the two put together, and he did not at present see that the landlords in that case got any adequate return for the payment they had to make. If a tenant had a twenty-one years' lease, it was a little hard to call upon the landlord to spend money for which he got no benefit during that time. Then again, he thought it was not quite clearly stated, how the rate was levied—whether it was in proportion to the benefits derived; for one portion of a district might derive a large benefit and others scarcely any at all. Some

people might consider 7s. 6d. to 10s. an acre a very substantial addition to their rent, spread over the 25 years for which the Act provided. So, if further legislation was to take place, it might be well to consider whether the repayment of capital and interest should not be spread over a period of 50 years instead of 25, which would reduce the annual sinking fund to one-fourth. Supposing the land was to descend from father to son, why should all be paid in the father's time, and nothing in the son's? and, in case of sale, the extra rent would be regarded as so much outgoing to be subtracted from the actual rent, and would make a material difference in the price realized for the land. Whatever difference of opinion, however, existed on the topics introduced in the Paper, he was sure there was one point on which they would all agree, namely, that Mr. GRANTHAM was entitled to their best thanks for the Paper he had read.

Mr. F. J. BRAMWELL (Associate of Council) briefly seconded the proposition.

Mr. P. D. TUCKETT (Member), referring to the question of education which had been introduced, hoped that the heads of the profession, and the great supporters of this Institution, would not countenance the notion that the good education of the surveyor was not to be encouraged. That he apprehended was one great object of this Institution: for, although a man might be tolerably successful in practice with an amount of education which, in after life, he regretted was not greater, still he thought the doctrine they should hold and put before the younger Members of the profession was, that the better the education, the better it would be for them afterwards.

Mr. T. MARR JOHNSON (Associate) asked to hear the

reasons which led Mr. GRANTHAM to introduce pumps, because it was found that these and similar artificial appliances offered impediments to the subsequent introduction of natural drainage. This was the case in the Witham and other fen districts; so soon as the proprietors had erected pumps and drained their own district, they naturally declined to participate in the expense of drainage projects which could no longer benefit them, and so became obstructors to combinations for improvements in the locality generally. He had understood, that fresh-water floods were regarded as a means of fertilizing land, and would like to hear the opinions of Members on this point. The water draining from the surface of well manured land in the upper levels, gathered up the manure and deposited it during floods on the flats in its passage towards the outfall; he had heard it remarked, that such floods were now less fertilizing than formerly, which was attributed to the great progress made in under-draining, by which the water was carried away underneath the soil instead of flowing off the surface. There was one other point of vital importance in arterial drainage, *viz.*, to determine to what depth below the surface of the land the surface of the water in the drains should be reduced. Whilst in some districts 4 feet was considered the proper depth, in other places 18 inches to 2 feet was regarded as the right thing. Information on this point would be valuable to the Members. He would also like to know what horse-power, per 100 acres, Mr. GRANTHAM generally calculated for pumps.

Mr. J. W. PENFOLD (*Hon. Sec.*) had taken part in the Malden and Sheen Valley drainage, when it was attempted to get an Act of Parliament for that purpose in 1859. The application for the Act was assisted in high quarters, and the promoters went before Committee, but it was

necessary to obtain the signatures and assent of a large proportion of the owners of the parishes through which the drain passed. The greater number of them being in another valley, having a distinct outfall, had no object in promoting the drainage, and would not have benefited a farthing by it. The time and the money for getting these assents were wanting, and the Bill was abandoned. If some such Act as the one now under discussion had been then in operation, he had no doubt the whole of that drainage would have been carried out.

Mr. GRANTHAM, in reply, said that he thought it would be very desirable to classify the rivers of England. Thus the Severn, Mersey, Trent, and Thames would rank in the first class, others would go in the second class, and these he would call the main arterial rivers of the country; thence they would descend to the fifth and sixth classes; and he had tried to prevail upon SIR HENRY JAMES to adopt such a classification of the rivers in his new map of England.

Mr. GRANTHAM then read portions of the abstract of the Act referred to as to the mode of procedure. He further, said, the usual qualification for a Commissioner was an income of £100 a year and residence in the same or adjoining county. He would state the duties of the Inspector, which would give a notion how the thing was conducted. The Inspector gave notice, and held a meeting, and enquired into the genuineness of the petition, the propriety of the boundaries, and the number of proprietors assenting or dissenting. He then visited the district, and examined minutely all the parts intended to be included within the area. His own practice had been to find the general flood-level, and then take 5 feet above that,—except in very flat countries such as fen lands, sometimes 2 and 3 feet,

which determined the limits of the jurisdiction, omitting all parts of a higher level. Sometimes the contour level was given to the Inspector, from which he judged the line to be laid down. He then took evidence as to the necessity of the case, and reported to the Inclosure Commissioners. This Act could not be applied in the Malden case, as the district was within the jurisdiction of the Metropolitan Board of Works, and therefore excluded from its provisions. With regard to borrowed money, the Act allowed 30 years for repayment ; but the Lands Securities Company had lent more money for these purposes than any other body, and they had not power to advance money for a longer term than twenty-five years ; that was the reason he had mentioned that period. Then as to what lawyers called the "incidence of rating," he had found it very various. Some valuers had taken the rate from the poor rate assessment. He did not regard that as the proper mode, and he should be glad to hear the opinion of the Institution on that point. It was the constant source of inquiry and discussion at those meetings how the parties were to be rated. His own idea was, that the Irish system was decidedly the better one, *viz.*, that the land should be valued before the works were begun, and revalued after they were finished, and sufficient time had elapsed to enable a judgment to be formed as to the effects : the difference between the first and second valuation being the basis of the rates. In some places, the plan adopted was to charge an equal acreage rate over the whole district. The parties near the outfall, who got all the benefit, paid no more than those at the upper part, who got very little benefit at all, and he quoted a case in point.

Mr. GRANTHAM then proceeded to point out, upon the plan exhibited of the Norfolk drainage referred to, the nature of the district, which had led him to adopt the

system of pumping, and mentioned that the power used was an average of 1 H.P. to 60 acres of land. With regard to the effect of the floods upon the fertilizing properties of the land, he would remark, in the case of the Leadon Valley, which discharged the drainage of 120 square miles, he had stated in the Paper, that the Leadon had been cut for 7 or 8 miles, and embanked on both sides for a considerable distance to confine the floods. Knowing, as he did, the value of the flood water, which was of a reddish-brown colour, he adopted sluices which opened both ways. A man could have a self-acting trap on the outer side, and open the flap, and keep open a hand-sluice at the other end. He could flood his land thereby, and when it had subsided let out the water, and so derive the benefit. He fancied, in large cases, the quantity of water delivered by pipe drainage was so small in comparison with that which came down a river as flood, that it would not have a material effect in reducing the fertilizing power of the water.

With regard to under-drainage, the plan he generally adopted was, a depth for pipes of 4 to 5 feet.

The vote of thanks having been unanimously carried, on the suggestion of Mr. E. J. SMITH, the further discussion was adjourned to the next Meeting.

The discussion was resumed at the Meeting, on January 25th, when

Mr. EDMUND J. SMITH (Member) said, the principal point to which he wished to refer was, the right mode of rating the areas included within any drainage scheme. The first case in which he was engaged embraced about 13,000 acres, on the north side of the river Don, between Doncaster and Fishlake. It was completed in the year 1837; and the course adopted was, first, to charge the whole area at an acreable charge, and afterwards to assess the various fields according to the advantage that they each

derived from the improvement. Since that time he had experienced almost every other mode of charge; for instance, it was extremely common to charge the estates within any area according to the assessment to the poor-rate, in which exactly those fields which were of the highest value were charged on the highest scale, and those which were in the poorest state were charged on the smallest scale. It was, therefore, perfectly obvious, on that system, that the fields of the higher class, which were not open to any great deal of improvement, were charged *ad interim*, or perhaps permanently, on the highest scale; while those fields in which the greatest improvement was effected were charged on the lowest scale. Therefore he continued of opinion, after an experience of thirty years, that the true system would be to make an acreable charge *ad interim*, and then to have a single assessment, charging the whole area according to the improvement effected. In the case he referred to, that improvement was ascertained on the opinion of an eminent land surveyor in the neighbourhood, who, in order to form a sound judgment, took the sections of the area which was within the charge. Passing from that time, which was thirty years ago, through a series of cases which would not interest the meeting, he came to the twenty-two cases referred to in the Paper, and of those he found he had been concerned in two. In the first case of those two the whole improvement was carried out in the most satisfactory manner at an exceedingly small cost. The *ad interim* payments were charged according to the assessment value on the poor-rates of the different parishes, and, ultimately, an assessment adjusted the charge according to the improvement effected. The other case was scarcely satisfactory. They would find, at page 74, that the cost of putting the powers of the Act into operation had been on an average £50 in each case; but he

apprehended that sum included only the expenses connected with the office of the Inclosure Commissioners, and nothing further. In the case he referred to, under 4,000 acres, he had the misfortune to be agent for between 100 and 200 acres, and after a cost of £2,500 had been incurred in making surveys and other admirable preliminaries, the whole thing came to an end, and there was about 13s. 6d. per acre to pay without any return whatever.

Mr. J. BAILEY DENTON (Member), before entering on the discussion, would like to place on record one or two facts with reference to the origin of the Act in question. He considered it was really the result of a public meeting held in London, in February 1861, called by himself, in conjunction with Sir HENRY VAVASOUR, in consequence of the evils that were then being made known in the agricultural journals, chiefly by the pen of Mr. ALGERNON CLARKE. There were many who came subsequently into the discussion, and no one did more service than their President. There was a committee appointed at that public meeting, and Mr. GRANTHAM acted as the secretary. The committee, as a deputation, waited upon Sir G. C. LEWIS, and it was there agreed that he (Mr. DENTON) should draw up the heads of a bill, which he did, and he further had the opportunity of laying the matter before Lord PALMERSTON, the Prime Minister, who took a great interest in the matter. With this brief explanation he would quit the subject; but he thought it was only fair to those who had taken a prominent interest in the matter that some of the credit should be given to them. Passing from that, he observed, he knew there was a very earnest intention on the part of one branch of the Government to adopt a conservancy for each of the river basins of the country. The subordinate valleys which

were tributaries to the main rivers would, sooner or later, either form part of that general conservancy board, or, by means of a separate commission be supplemental and subservient to it. Until they arrived at that point he thought they would do but little towards the accomplishment of the purposes of the Act of 1861. Speaking from some experience, he could say, comparatively, it was a failure. The districts were generally small; the expenses were, if the work was well done, heavy. Upon the subject of rating, which was really a matter of very great moment, though not following quite the course of Mr. SMITH, in the main, he agreed with him; but he would rather that, instead of an *ad interim* charge of any kind, there should be an outfall charge,—a uniform outfall acreage charge throughout the district,—and that that should be supplemented by an improvement charge, which should equalize differences according to the benefit derived. That, he was aware, was a distinction without much difference; but still he thought if they designated the first an outfall charge, and made that uniform, and the supplemental charge an improvement charge to balance, it would be doing the right thing to all parties. As for making the parochial assessment the basis of the rating he thought it was a fallacy, and could not be supported by men of common sense.

Mr. FRANCIS VIGERS (Member) thought they had taken too narrow a view of the subject. They need trouble themselves little in the present day as to who were the originators of the Act of 1861. What they had to deal with was the broad question of the natural arterial drainage of the country, and the way in which they, as an Institution of Surveyors, could assist the Government, when the proper time came, in the consideration of that question. They all knew that the rivers of this country, either from neglect, or by erection of mill-dams, &c., for the purposes of trade,

were, in fact, a great bar to general drainage, and he thought, as they had Members in all parts of the kingdom, if each one would contribute some information as to the obstructions which exist upon any particular river with which he was acquainted, they might get a mass of information which, in the hands of the Council, might be worked up into some form useful to the country, and creditable to themselves as an Institution. He was better acquainted with the Mole than any other river, and, for his part, he would be happy to furnish a survey of that river from its source to its outfall, together with the flood areas on each side of the river, which would be benefited by the removal of the obstructions. If other Members would do the same with other rivers, they would be greatly assisting the object they all had in view.

Mr. R. C. DRIVER (Member) could bear testimony to the fact that in Gloucestershire there were immense areas of land on which irrigation and drainage were prevented entirely by such obstructions in the rivers as Mr. VIGERS had alluded to. Upon the Chelmer there were mills which he undertook to say did not pay a rental of three per cent. upon the original outlay, and which were a positive obstruction to any improvement. And he might say that, in his experience, this was the case pretty well all over England. In the case of the drainage of an estate in Gloucestershire, in which he was engaged, it was alleged that the mill owners below stream had been deprived of water consequent on a storage of the drainage water in a valley, where there was formerly only a large brook. Inquiry was set on foot, and it was found there was no deficiency of water thereby : but it caused great expense and trouble.

Mr. J. W. BARRY (Associate) remarked that it appeared to him the two principles of drainage and mills must always be antagonistic, and the question to be decided was which

was the more valuable of the two? Then again rivers were not only useful for drainage but also for navigation, and they had to consider whether navigation was more useful than drainage, or drainage than navigation. It appeared to him that any mode of dealing with the subject which omitted these considerations would only deal with it partially, and therefore he thought any gentleman who gave them surveys and details of rivers should also go into the question of the relative value of the mills or of navigation, as the case might be.

Mr. FRANCIS FULLER (Member) mentioned a case where the question was that of mill rights against those of irrigation, and there was extreme difficulty in discovering whether the mill owners had the legal right to prevent the use of the water by the owners of the meadows; and as the estate in question belonged to an old Roman Catholic family, it was thought that some light might be thrown on the matter by making a journey to Rome. Plans were found there so accurate and beautiful, and with the documents set forth the rights of the parties so clearly, that there was no difficulty in settling the question in dispute, and the law suit was brought to an end on that evidence.

Mr. E. P. SQUAREY (Member) would add to the cases already mentioned one which occurred in his own experience. A small tributary stream of the Thames, near Wallingford, was seriously penned back, and it was thought that an advantage would be gained by purchasing the mill rights and thus draining the upper lands. The matter was carried out in a most satisfactory manner, but it was to be regretted that an engineer was not called in; because it was found that though, in certain sections of the stream, the operations gave a beneficial result, and that a portion of the land at the lower end was enormously improved in value, yet, through a long series of years under the existing mill rights, a silting-

up had taken place in the upper part, which prevented that part from receiving the benefit which was obtained at the lower end. An engineer would probably have detected this, and better results might have been at once attained. At all events it was now proposed to lower the part which had silted up, and it was believed they would then have secured the effect of improving some 700 acres of land to an extent varying from 20 or 38 per cent. The cost of purchasing the mill rights was £2,500; he could not state the cost of the works per acre, but these are very light, merely consisting of cleansing the course of the brook. The whole was met by an *ad valorem* rate, according to the benefit conferred, over the whole property.

Mr. F. J. CLARK (Member) would mention, among numerous others which came within his knowledge, one case on the estate of a nobleman, where about 3,000 acres of land were undrained, by reason of the existence of a mill and dam; the mill being let at a rental of something like £85 a year. Being called in to advise upon the case, he recommended his client to pay compensation to the tenant of the mill and do away with it, so that no impediment to the drainage should exist.

Mr. R. B. GRANTHAM (in reply upon the discussion) said he was happy to find his notions of rating were in the main confirmed by a gentleman of Mr. SMITH's experience. The difficulty, at the first, generally was how to get money to pay for the works, for of course until these were open the results could not well be anticipated. He thought the better plan was, as Mr. SMITH suggested, that there should at first be an equal acreable assessment; but then he would recommend the rating upon the improved value of the land should also at first be only carried over a limited time,—say five years,—after which the land should be again re-

valued, so that the change might be better appreciated. In laying out the boundaries of districts he tried to avoid house property and tenements as much as possible, because they were interested in the matter only to a limited degree in proportion to the area. It was a mistake to base the rate on the rental, and he knew a case in which cottages, rented at £3 to £4 per annum, were charged £1 16s. for preliminary expenses of the drainage. The £50 expenses for putting the Act into operation applied chiefly to the Inclosure Commissioners' office, including the advertising of the notices, inspections, &c., and for this sum powers are conferred as by an Act of Parliament. There was more expense in getting up the plans, the petition, and the assents and dissents required by the Act, as also of holding the preliminary meetings, inspections, &c., but altogether it did not amount to very much. Since the last meeting he had visited one of the districts referred to in his paper, which he had not seen for a year and a half after the work was done; he found it was going on well, and the land had been benefited to the amount of £1 per acre by the operations, thus confirming the statement he had made. He had also inspected and set out another district in the valley of the Parrett, and two or three other large schemes were on foot. He thought some such conservancy of the river basins as Mr. BAILEY DENTON had referred to would be of the greatest advantage for the rivers Parrett, Isle, Yeo, and Tone. He did not intend in his paper to raise any question as to the originators of the Act; what Mr. BAILEY DENTON said with regard to the first meetings to assist the Government was correct, but he would not further discuss the matter.

The PRESIDENT agreed with Mr. VIGERS in saying they ought to confine themselves as much as possible to the discussion of broad principles; but he confessed that engineers were better qualified than he was to discuss the

great river valleys. Mr. BARRY had hit the true point, when he said it was a question of the relative value of mills, drainage, and navigation. He, the President, was concerned in the great valley of the Ouse, and acted as arbitrator between the navigation interests and the railway company, and he found, when the matter came to be discussed, that the receipts of the navigation were not sufficient to keep the works and locks in repair. They were in such a state that the whole of the land was flooded and damaged, and, in addition to that, the river, which was valueless for navigation, had mills upon it. The valley of the Mole was so narrow that it was doubtful whether the improvement of that river could be repaid. But it was different with large rivers like the Severn and the Thames. The latter was, perhaps, the worst drained district he was acquainted with; the drainage was destroyed by the navigation and by mills; the navigation was valueless; there was not money enough to put the locks in decent repair, and it was a question whether, on any great flood occurring, some of them would not be carried away: the Thames valley of itself would provide business for half-a-dozen engineers and a dozen surveyors, and the advantages would be so enormous that they could not be overrated. Land would be improved at least five times in value. No doubt the Land Drainage Act was of great advantage, as giving opportunity to the majority to override the minority, which was always a difficulty on all questions of inclosure or drainage of land. In the case of the Leadon valley, referred to in Mr. GRANTHAM'S Paper, half the cost incurred was for the purchase of mill property alone, and the cost of the works amounted to only about thirty per cent. of the sum expended. In other words, but for the mills, the improvements could have been effected for 3s. 10*d.* per acre, instead of 10s. per acre; and he thought if they took any great district they would find that to be a tolerable average of the

cost of getting rid of the obstructions in the rivers. With regard to the fertilizing property of floods, since pipe drainage was introduced it would be found that the water discharged through the pipes was not so muddy or so thick as if it had run off the surface, as was formerly the case. He was consulted by the Arterial Drainage Commissioners of Ireland, and was asked to say whether he thought it was prudent entirely to shut out flood water. He replied, certainly it was. If they shut out the flood at all it should be done absolutely; as the people, if that were done, would break up and plough the grass land. The question as to the depth of water below the surface of the land in fen districts could only be answered relatively. If it was to remain in grass, it did not require to be taken far below. If it was to become arable, it must be taken at least 4 feet below the surface. He had the management of a large district in the fens of Lincolnshire, in the Black Sluice, and other districts, where the land, which used to let as pasture at £3, became, a few years after the drainage, almost worthless; but when the tenants were allowed to break it up it went back to its former value. In Ireland, the rating was under a central board, and an experienced surveyor went over the district prior to the commencement of the works and after they were completed, and then fixed the rate at which they should be assessed, which, he thought, was by far the best plan. With regard to steam power, they were all agreed that if they could get a natural drainage no one would at this time of day use steam power, with its attendant expenses, and its incapacity to do more than a certain amount of work. He was very glad to hear that the Government had taken up the question of the conservancy of the great river valleys of the country, and if this Institution could render assistance in forwarding so important an object, he was sure it would readily be given.

PAROCHIAL ASSESSMENTS.

By EDWARD RYDE, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
January 25th, 1869.*

THE PRESIDENT IN THE CHAIR.

It was originally intended in this Paper to deal with the subject of "Parochial Assessments" in all its phases, viz.:—I. To give "Historical Notes" of the legislation on the subject, and of the purposes for which the various rates and taxes have been authorized. II. To point out in respect of what property they are imposed, or what is subject to them; and the mode in which such property is to be valued for the assessment. III. To consider the form, allowance, publication, and collection of the various rates, the persons who are liable for their payment, the remedies of parties against unfair and incorrect assessments, and the tribunals to which appeals have to be made.

The subject was, however, found to be so large that justice could scarcely be done to it in a single Paper; and, bearing in mind that the Transactions of this Institution are printed, and will become in time books of reference, it was decided that, instead of superficially treating a few of the more popular and interesting points, the Paper would be more useful hereafter—if less entertaining at the present moment—if it were confined, on this occasion, to the first branch,—Notes on legislation, and the purposes of the rates.

The term "Parochial Assessment" is meant to include those compulsory local rates and taxes which are imposed and levied within parishes, boroughs, hundreds and counties, for public or common purposes. The Paper is confined generally to England and Wales, and taxes levied under Acts for special local purposes, such as "The Metropolis

Local Management Act," are not referred to. Neither is the tithe rent charge nor the land tax included. Each of these is worthy of a separate Paper, and should be so dealt with.

The authorities for the various rates and assessments are comprised in the provisions of upwards of two hundred and fifty Acts of Parliament; and if the language of the Paper should appear to savour of a legal character, the explanation is, that the language of the statutes themselves has been made use of as much as possible, in order that the original meaning may be preserved.

Perhaps the most ancient rate is the church rate, now for all practical purposes abolished. For many centuries it was the only parochial tax; the relief of the poor having been, before the time of Henry VIII., a charge on the revenues of the clergy.

Probably the next in order of antiquity is the sewer rate, followed by the poor rate; but neither of these ancient rates was exactly similar in its original features to those now levied under comparatively recent statutes.

In the year 1285, in the thirteenth year of Edward I., provision was made by statute for the repair of churches, the Ecclesiastical Courts having the exclusive power of deciding on the validity of the rate and the liability of the person to pay it.

In 1530, the Parliament of Henry VIII. provided for the repairs of bridges and highways; and in 1531-2, authorized the levying of a rate "for the making, correcting, repairing, amending, and reforming walls, ditches, banks, gutters, sewers, gotes, calcies, bridges, streams, and other defences by the coasts of the sea and marish ground: and for making new and cleansing and purging trenches, sewers, and ditches in all places necessary: and for reforming, amending, prostrating, and overthrowing all such walls, streams, ponds, locks, fish-garths, hebbing-weirs, and other

1285.
13 Edward I.
Church Rate.

1530.
22 Henry VIII.
1531-2.
23 Hy. VIII., c. 5.
Sewers' Rate.

impediments and annoyances as are found to be excessive or hurtful."

These two Acts of Parliament practically laid the foundation for the county rate and sewers' rate of the present day.

Previous to the year 1550, the lands of the King were not liable to sewers' rate; but the Parliament of Edward VI., in that year, passed a statute, by which it was enacted that such lands should in future be subject to the same liability as the lands of any of the King's subjects. This Act, which is intituled "An Act for the continuance of the Statute of Sewers," made perpetual the Act of Henry VIII.

The churchwardens were the persons who levied the church rate, and from time to time they were authorized to impose penalties upon the parishioners for various statutable offences, among which, the following are examples:—

A penalty of 12*d.* for each Sunday, for not attending divine service.

1558-9.

1 Elizabeth, c. 2.

A penalty for eating flesh on fish days.

1562-3.

5 Elizabeth, c. 5.

A penalty for tippling and drunkenness.

1606-7.

4 James I., c. 5.

A penalty of 3*s.* 4*d.* for using unlawful pastimes on the Lord's day.

1625.

1 Charles I., c. 1.

A penalty for exercising a worldly calling on the Lord's day.

1677.

29 Charles II., c. 7.

In 1571, provision was made for the recovery of sewers' rate, by authorizing the sale of land liable to the rate, and by the infliction of pains and penalties; and in 1572, a rate, in the nature of a county rate, was authorized, to raise funds for the use and maintenance of prisoners.

1571.

13 Elizabeth, c. 9.
Sewers' Rate.

1572.

14 Elizabeth.

In 1601, the Parliament of Elizabeth passed the remarkable statute which to this day regulates the levy of the poor rate. The enactment is "that the overseers shall take order to raise weekly or otherwise, by taxation,

1601.

43 Elizabeth, c. 2.
Poor Rate.

a convenient stock of flax, hemp, wool, thread, iron, and other ware and stuff, to set the poor on work; and also competent sums of money for and towards the necessary relief of the lame, impotent, old, blind, and other persons poor and not able to work; and also for putting out of poor children to be apprentices; and to erect, build, and set up in fit and convenient places of habitation, on wastes or commons within their parish, convenient houses of dwelling for the impotent poor."

It is creditable to the wisdom and forethought of the Parliament of that day, that this notable statute continues, unaltered and unamended, to be the chief authority upon which is raised the great bulk of the local taxation of the present time.

1608-4.
1 James I.
1609-10.
7 James I.
7 James I., c. 4.
7 James I., c. 5.
1623-24.
21 James I.

1627.
8 Charles I.

1662.
13 & 14 Charles II., c. 4.

1662.
13 & 14 Charles II., c. 12.
Constables' Rate.

1666.
19 Charles II.
1691.
3 William and Mary, c. 11.
1695-6.
7 & 8 Wm. III., c. 84.

The Parliament of James I. authorized two prisoners' rates and a rate for houses of correction, protected churchwardens in actions brought against them for things done by virtue of their office, and directed the reimbursement to the poor rates of monies expended in relief to families of persons running away under sureties. In 1627 a further rate in respect of houses of correction was authorized, and in 1662 churchwardens were authorized to levy a penalty of five pounds on an incumbent for not reading the common prayer once a month, from which it may be inferred that church services, at least in rural districts, were not very frequent in those days.

The constables' rate, as now understood, had its origin in the year 1662, in the reign of Charles II., but as the constables' tax, or tithing or town levy, it is one of the most ancient of taxes. The objects of the Act of 1662 were to reimburse constables, head borough or tithing men, their charges in relieving and carrying rogues, vagabonds, and sturdy beggars to houses of correction or workhouses. The Parliament of Charles II. authorized a poor prisoners' rate, and that of William and Mary passed several

statutes relating to the recovery of church rates, more especially from Quakers, the costs of appeals, and the maintenance of gaols.

1696-7.
8 & 9 Wm. III.,
c. 30.
1698-9.
11 & 12 Wm. III.

During the reign of Queen Anne several statutes were passed relating to the repair of bridges and highways, the sending apprentices to the sea service at the expense of the poor rate, the levying by churchwardens of penalties in the case of servants who carelessly fire houses, authority to the commissioners of sewers to distrain for rates, provision for the expense of gaols, and for the conveyance and maintenance of rogues and vagabonds.

1702.
1 Anne.

1703.
2 & 3 Anne, c.
1706.
6 Anne, c. 31.
1708.
7 Anne, c. 10.
1711.
10 Anne.
1712.
12 Anne.

The rating statutes during the reign of George I., though unimportant, are of a practical character. It appears to have been necessary to make further provision for the recovery of church rates from Quakers. Overseers were authorized to seize and sell the goods and chattels and to hold the lands of persons running away and leaving their wives and families chargeable upon the poor rates; further provision was made concerning gaols, and for building, altering, enlarging, purchasing, hiring, and fitting up of workhouses; and the justices who may act in matters relating to rates and taxes are specified.

1714.
1 Geo. I., Stat. 2,
c. 6.
1718.
5 Geo. I., c. 8.

1719.
6 Geo. I.
1722.
9 Geo. I., c. 7.

The legislation during the reign of George II. is important:—

After passing, in 1732, an Act giving to justices power to cause any defect of form in any judgment or order made upon appeals at Quarter Sessions to be rectified and amended, Parliament passed, in 1739, the statute which has ever since formed the basis of the county rate. Previous to that time new and distinct rates were constantly created for purposes of comparatively little importance, and to raise sums of money quite insignificant in amount. Thus, as we have seen, there were separate rates for county bridges, for building and repairing county gaols, for building and maintaining houses of correction for vagrants, for the passing and

1732.
5 Geo. II., c. 19.

1739.
12 Geo. II., c. 29.
County Rate.

conveying of such vagrants, for the relief of prisoners (called gaol money, not to exceed 6*d.* or 8*d.* weekly for each parish), for the relief of poor prisoners (debtors) and setting them to work (no parish to be rated for these purposes at more than 6*d.* weekly), for relief of poor prisoners of the King's Bench and Marshalsea (each county to send 20*s.* at least yearly to each of the said prisons).

The preamble of the 12th Geo. II., chap. 29, recites "that it is apparent that the manner and methods prescribed by the said several respective Acts for collecting some of the said rates are impracticable, the sums charged on each parish in the respective divisions being so small that they do not, by an equal pound rate, amount to more than a fractional part of a farthing in the pound on the several persons thereby rateable; and, if possible to have been rated, the expense of assessing and collecting the same would have amounted to more than the sum rated."

The Act proceeds to authorize one general county rate, in lieu of the several, separate, and distinct rates herein previously referred to, viz.:—22 Henry VIII. and 1 of Anne, relating to bridges and highways; 11 and 12 Wm. III., 10 of Anne, and 6 George I., concerning gaols; 7 James I., 43 Eliz., and the 3 Charles I., respecting houses of correction; 14 Eliz., 1 James I., 21 James I., 3 Charles I., relating to prisoners; 19 Charles II., providing for poor prisoners; and 12 Anne, concerning rogues and vagabonds. Since the year 1739 the Legislature has been tolerably consistent, in connecting all new purposes for which the county must be taxed with the county rate.

1740.
13 Geo. II., c. 18.

1743.
16 Geo. II., c. 18.

1744.
17 Geo. II., c. 3.

1744.
17 Geo. II., c. 37.

After some unimportant legislation concerning rates generally, the disability of certain justices to act in certain cases, and the publication of rates, provision was made in 1744 that, where there is any dispute or uncertainty in what parish lands improved or drained lie, such lands shall be assessed to all parochial rates within the nearest parish.

This provision appears to relate chiefly to lands reclaimed from the sea.

The rate-book, so familiar to surveyors, was instituted in 1744. The overseers of every parish are directed to provide a book, and to take care that true and just copies of all rates for the relief of the poor be fairly wrote and entered therein. They are carefully to preserve such book in some public or other place in every parish, whereto all persons assessed or liable to be assessed may freely resort.

The fees to coroners of 20s. for each inquisition, and of 9d. a mile travelling expenses, are charged upon the county rate in 1752, and the costs of constables in prosecuting persons keeping gaming or other disorderly houses are authorized to be paid out of the poor rates.

The rating legislation of the reign of George II. is brought to a close with three more Acts, providing that the county rate shall bear the expense of prosecuting persons for plundering shipwrecked goods; of conveying offenders to gaol; and giving a power of distress and sale of goods and chattels for the non-payment of rates.

The Act, popularly known as "Gilbert's Act," was passed in 1782. Among other things, it provided for the formation of unions, and made better provision for the building, altering, enlarging, purchasing, hiring, and fitting up of workhouses.

During the next twenty years the rating legislation is unimportant. Better provision is made for the recovery of rates by distress, and the cost of prosecuting paw-brokers is thrown upon the poor rates.

In 1801 an Act is passed, containing important provisions respecting notices of appeal, to be treated hereafter in connection with that branch of the subject; and another Act renders the county rate liable for the expenses of special constables, for executing warrants in cases of felony, and for an allowance to high constables in cases of riot or felony.

1744.
17 Geo. II., c. 38.
Rate Book.

1752.
25 Geo. II., c. 29.

1752.
25 Geo. II., c. 36.

1753.
26 Geo. II., c. 19.
1754.
27 Geo. II., c. 3.
1754.
27 Geo. II., c. 20.

1782.
22 Geo. III., c. 83.

1793.
33 Geo. III., c. 55.

1800.
39 & 40 Geo. III.,
c. 99.

1801.
41 Geo. III., c. 28.

1801.
41 Geo. III., c. 78.

1802.
42 Geo. III., c. 90.
Militia Rate.

In 1802, the militia rate is authorized to pay volunteers a sum not exceeding £6 each, to serve in the militia, to pay half the price for volunteers or for substitutes, for men chosen by ballot to serve in the militia, and drawn or ordered out for actual service; to pay bounties to men continuing to serve after their original term of service as volunteers; and if there be not a poor rate in hand for the purpose, to pay the fines of £10 for each man deficient.

1808.
48 Geo. III., c. 75.
Burial of the
Dead Rate.

The burial of the dead rate was passed in 1808, for the purpose of reimbursing overseers for payments, costs, charges, and expenses incurred in burying dead human bodies found on the shore of the sea.

1810.
50 Geo. III., c. 49.

In 1810, an Act was passed requiring overseers to render a just and true and perfect account of all things concerning their office, verified on oath before two justices at a Special Sessions.

1812.
52 Geo. III.,
c. 146.
Church Rate.

In 1812, it is enacted that the church rate is to provide register books whenever required by the officiating minister, and a dry well-painted iron chest for keeping them.

1813.
53 Geo. III.,
c. 127.
1814.
54 Geo. III.,
c. 170.

In 1813, further provisions were passed for the levy of church rates, and in 1814 the justices are empowered to excuse rates on the ground of poverty.

1815.
55 Geo. III., c. 50.
Gaol Fees' Rate.

In 1815, the gaol fees' rate was established, and its purposes defined as follows:—

“To pay allowances to gaolers and servants of prisons, by way of salary or compensation for fees or gratuities formerly payable by prisoners on entrance or commitment to prison, or discharge therefrom: for payment of allowances instead of fees, formerly payable on their discharge, by prisoners charged with felony or misdemeanour and acquitted, to clerks of the peace, clerks of the court, or their respective deputies: for payment of compensation to sheriffs or under-sheriffs, instead of fees or gratuities formerly paid by debtors, on their discharge, for their liberation.”

In the same year the county rate is made responsible, in addition to the purposes of the rate as defined by 12 Geo. II., c. 29, for all the other purposes to which county rate or stock is or may hereafter be made liable by law. 1815.
55 Geo. III., c. 51.

By the 55 Geo. III., c. 137, all goods and chattels bought for the use of the poor of any parish are vested in the overseers. 55 Geo. III.,
c. 137.

In 1816, provision is made for the settlement of any dispute concerning any boundary of any place affecting the county rate. 1816.
56 Geo. III., c. 49.

In 1817, an Act is passed containing important provisions concerning appeals against county rates. And in 1818, provision is made for defraying, by church rates, the expense of enlarging or extending the accommodation in churches or chapels existing in any parish, for the purpose of purchasing sites for new churches in populous parishes, and for payment of principal and interest on any monies advanced for building churches or chapels. 1817.
57 Geo. III., c. 94.

1818.
58 Geo. III., c. 45.
New Church
Rate.

In 1818, by an Act, commonly known as Sturges Bourne's Act, tenements not greater than £20 annual value, nor less than £6, were for the first time permitted to be rated for the relief of the poor to the owner instead of the occupier. 58 Geo. III., c. 69.
Sturges Bourne's
Act.

In that year also overseers were authorized to charge to the poor rates the expense incurred in prosecuting persons keeping gaming or disorderly houses. In 1819 the inhabitants of any parish in vestry assembled were authorized by statute to nominate and elect an assistant overseer, whom two justices may thereupon appoint, and who is then authorized to perform the duties of an overseer. The churchwardens and overseers were also authorized to make a deduction of one-half the amount of poor rates in cases where the owner paid the rates for a year, the property being let to a tenant for a shorter period than three months. 58 Geo. III., c. 70.

1819.
59 Geo. III., c. 12.

By an Act of the same year the right of voting in parish vestries is defined. 59 Geo. III., c. 85.

The early years of the reign of George IV. do not comprise any very important rating statutes. There are several Acts providing among other things the following:—

1821.
1 & 2 Geo. IV.,
c. 85.

In cases of insufficient distress for a county rate within a county, goods and chattels belonging to the same person in another county may be distrained.

1822.
8 Geo. IV., c. 28.

When any poor rate has been made, allowed, and published, and when demand of payment has been made, justices may issue a summons and subsequently issue their warrant.

1823.
4 Geo. IV., c. 46.

Payment to be made out of county rate of salaries of officers of gaols and prisons, the expenses of altering, building, or re-building gaols and houses of correction, and the purchase of houses and land for the building or enlarging of prisons.

1825.
6 Geo. IV., c. 50.

Also out of the poor rate of the expense of printing a sufficient number of jury lists.

1826.
7 Geo. IV., c. 63.
County Rate for
Building Shire
Halls.

In the year 1826 the Act was passed which authorizes the levy of a county rate for the building or re-building, enlarging or improving, repairing, and upholding of any shire hall, county hall, or other building accustomedly made use of for holding the assizes or any grand or other sessions of the peace, or of any lodgings for the accommodation of Her Majesty's justices of assize in or for any county, for the purchase of lands for the said purposes, and for payment of interest on money borrowed.

1827.
7 & 8 Geo. IV.,
c. 31.
Hundred Rate.

In the year 1827 the statute was passed which authorizes the levy of a "hundred rate," to yield full compensation to persons damnified by the felonious demolition, pulling down, or destruction, wholly or in part, by any persons riotously and tumultuously assembled together, of any church or chapel, house, outhouse, buildings, trade premises, machinery, fixtures, and furniture.

Since the passing of this Act the ancient common law hundred rate may be considered as obsolete.

1828.
9 Geo. IV., c. 40.

A special county rate for the provision of county lunatic

asylums was directed to be made in 1828, and further provision in relation thereto was made in the year 1830.

In 1831 there were several Acts of Parliament passed in connection with rating matters, the more important of which were two statutes affording means for providing land for the poor, and the statute popularly known as Hobhouse's Act, which requires vestries to publish annually a list of parish estates, charitable foundations, and bequests, and the rental and appropriation of each.

In 1832, a hundred rate was authorized, to yield full compensation to persons damnified by the feloniously cutting, breaking, damaging, or destroying, by any persons riotously and tumultuously assembled together, of any thrashing machine, whether fixed or moveable, or of any part thereof, and also for any damage which may at the same time be done by any such offenders to any erection or fixture whatever in or about or belonging to any such machine.

In the year 1833, a sewers' rate was authorized to be levied for any of the purposes of the Act of Henry VIII.; and for the purchase of lands necessary; and for the payment, within fourteen years, of money borrowed; and for recompense and allowances to clerks and other persons employed by the Court of Sewers; and for the payment of all costs and charges incurred in surveying, measuring, planning, and valuing of lands, or in or about any litigation; and for the payment of all necessary allowances, charges, and expenses of putting the Acts relating to sewers into execution, and the contingent expenses of working the Commission of Sewers.

By a statute passed in 1833, churches, chapels, and other places of religious worship, were exempted from poor and church rates, provided no person received any rent or derived any profit from any part of them.

In the same year a drainage and enclosure rate was authorized, for defraying expenses incurred (after the final

County Lunatic Asylums.
1830.

11 Geo. IV., and
1 Wm. IV., c. 1.
County Lunatic Asylums.
1831.

1 & 2 Wm. IV.,
c. 42, and 1 & 2
Wm. IV., c. 59.

1 & 2 Wm. IV.,
c. 60.
Hobhouse's Act.

1832.
2 & 3 Wm. IV.,
c. 72.
"Hundred Rate."

1833.
3 & 4 Wm. IV.,
c. 22.
Sewers' Rate.

1833.
3 & 4 Wm. IV.,
c. 30.

1833.
3 & 4 Wm. IV.,
c. 35.
Drainage and
Enclosure Rate.

award of commissioners) in repairing, superintending, or renewing roads, drains, banks, bridges, and other works set out and made by commissioners under divers Acts of Parliament, from time to time passed, for the drainage, enclosure, and improvement of lands, commons, and waste ground.

1833.
3 & 4 Wm. IV.,
c. 90.
Lighting and
Watching Rate.

The lighting and watching rate was authorized in the same session of Parliament, for lighting or watching, or for lighting and watching any parish; for providing fire-engines and places for keeping the same, and for paying proper persons for keeping them.

1834.
4 & 5 Wm. IV.,
c. 76.
Poor Law Amend-
ment Act.

The important statute known as "The Poor Law Amendment Act" was passed in 1834. By it the general administration of the poor laws is made subject to the regulation and direction of the Poor Law Board, who are authorized by this Act to make rules, orders, and regulations for the management of the poor; for the government of workhouses; for the education of the children therein; for apprenticing the children of the poor; for the guidance and control of all guardians, vestries, and parish officers, so far as relates to the management or relief of the poor, and the making or entering into contracts, and auditing accounts. Power was also given by this Act to the Poor Law Board to create unions; to order guardians to erect union workhouses, and to make a workhouse building rate.

1835.
5 & 6 Wm. IV.,
c. 50.
Highway Rate.

In the following year the Act was passed which consolidated and amended the laws relating to highways in England, and provided for the repair of the highways, roads, bridges, not being county bridges, carriage-ways, cart-ways, horse-ways, bridle-ways, footways, causeways, churchways, and pavements liable to be repaired by the parish.

Additional Rate
for purchasing
land.

In cases where there does not appear sufficient money in the hands of the surveyor, for the payment to owners

of the recompense to be made for ground taken to widen highways, or for making new ditches and fences, two justices may direct the surveyor to make, collect, and levy an equal additional rate for the purpose; and where the money collected and raised by fines, forfeitures, and rates, is not sufficient, after defraying the expenses of repairing the highways, to defend any prosecution, or to prosecute or defend any appeal agreed to be defended or prosecuted respectively by the inhabitants in vestry assembled, the surveyor may make, collect, and levy an additional rate.

The rating legislation of 1835 included provision for charging to the county rates certain expenses connected with weights and measures; for the purchase or hire of lands and buildings for workhouses; and for the recovery of church rates from Quakers; and for the establishment of a borough rate.

The borough rate may be raised in the nature of a county rate, if at any time the funds of any borough are insufficient for payment of debts of the Corporation and interest thereon; for the payment of the salaries of mayors, recorders, police magistrates, town clerks and treasurers, and of all other officers whom the Town Council may appoint; for the payment of the expenses incurred in preparing and printing burgess lists, ward lists, and notices, and other matters attending elections; for paying any sums payable by the borough to the treasurer of any courts; for the payment of the expense of maintaining the borough gaol, house of correction, and corporate buildings; and in boroughs having separate Quarter Sessions of the Peace, for paying the expenses of the prosecution, maintenance, and punishment of offenders; and for payment of all other expenses necessarily incurred. But, on the appointment of a watch committee in any borough, the powers to levy a watch rate under previous Acts of Parliament shall cease.

Additional Rate
for Law Ex-
penses.

1835.
5 & 6 Wm. IV.,
c. 63.
5 & 6 Wm. IV.,
c. 69.
5 & 6 Wm. IV.,
c. 74.

5 & 6 Wm. IV.,
c. 76.
Borough Rate.

1836.
6 & 7 Wm. IV.,
c. 71.
Tithe Rent
Charge.

The general rule that no property is a subject of a rate unless it be locally and visibly within the parish, and productive of a private profit within the parish, would have excluded tithe rent charge, but for a statute passed in 1836, which makes tithe rent charge liable to all Parliamentary, parochial, county, and other rates, in like manner as the tithes were before they were commuted.

6 & 7 Wm. IV.,
c. 96.
"An Act to re-
gulate Parochial
Assessments."

In the same year was passed the important Act for the regulation of parochial assessments, which provides that "from and after such period, not being earlier than the 21st day of March, 1837, as the Poor Law Commissioners shall direct, no rate for the relief of the poor in England and Wales shall be allowed by any justices, or shall be of any force, which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto, that is to say, of the rental which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and tithe rent charge, if any, (the tenant paying them in addition to the rent,) and deducting these from the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent."

1837.
1 & 2 Vic., c. 45.

In 1837 the practice of giving public notice in churches and chapels, during or after divine service, was abolished by a statute, by which it was required that all future notices should be written or printed, and affixed on or near the doors of all churches and chapels within the parish, previously to the commencement of divine service.

1839.
2 & 3 Vic., c. 28.

In 1839 a borough watch rate was authorized in the case of any borough watched by day and night, where the borough fund is not sufficient (with the aid of the watch rate, which may be made under the Act 5 and 6 Wm. IV., c. 76) to defray the expense of the constabulary force of the borough, together with all the other expenses legally payable out of the borough fund.

In the same year, the appointment by guardians of a poor-rate collector, under the authority of the Poor Law Commissioners, was sanctioned by statute. 2 & 3 Vic., c. 84.

In the same year it was enacted that, when the justices of the peace of any county assembled at Quarter Sessions have agreed that the ordinary officers appointed for the preservation of the peace are not sufficient for the preservation of the peace, the protection of the inhabitants, and the security of property within the county, and when the Secretary of State has made and settled rules for the government of the constables, the justices may appoint a chief and other constables, and make a police rate for the payment of their salaries, allowances, and expenses; and, in the following year, the expense of building, hiring, repairing, and furnishing station-houses and strong rooms, and of purchasing lands for the purpose, was provided for. 2 & 3 Vic., c. 93.
Police Rate.

In 1840, an Act was passed specially exempting profits in trade from rating until 31st December, 1841. This Act has been continued by subsequent statutes to the present time. 1840.
3 & 4 Vic., c. 89.

In 1841 an Act was passed to amend an Act passed in the 3rd and 4th years William IV., intituled "An Act to Amend the Laws relating to Sewers." It authorizes a general sewers' tax for all of the following purposes:—"For recompenses and allowances decreed and ordered by the Commissioners of Sewers to clerks and others employed by the Court of Sewers; for allowances to witnesses attending to give evidence before the Court, either in support of any presentment or order of Court or in opposition thereto; and for payment of jurymen such allowances as the Court may deem just; and for payment of all charges attending the putting of the Acts relating to sewers into execution; and for repayment of money borrowed, with interest." 1841.
4 & 5 Vic., c. 45.
Sewers' Rate.

In the same year further provision was made in relation to the county rate, by authorizing the borrowing money for maintaining, altering, widening, repairing, improving, and 4 & 5 Vic., c. 49.

rebuilding of county bridges, and repaying the principal by fourteen annual instalments.

4 & 5 Vic., c. 59.

Also, in 1841, an Act was passed to authorize for one year the application of a portion of the highway rate to turnpike roads, where the funds of the Turnpike Trust were insufficient for the repair of the turnpike roads within any parish.

1846.
9 & 10 Vic., c. 74.
Baths and
Wash-houses.

In 1846 it was deemed expedient to pass an Act to encourage the establishment of public baths and wash-houses, the expenses of carrying the Act into execution being charged upon the borough fund and defrayed out of the borough rate, the income derivable from such baths and wash-houses being credited to the same fund.

1847.
10 & 11 V., c. 34.
" Towns
Improvement
Clauses Act,
1847."

Under the ministry of Sir Robert Peel, in 1847, was passed one of the first of the eleven statutes which have since been termed the model Acts. It was an Act for consolidating in one Act certain provisions usually contained in Acts for paving, draining, cleansing, lighting, and improving towns. Clauses 156 to 184 are those which relate to the rates directed to be made by the Act, and clauses 185 to 190, to appeals against such rates. This was the first Act relating to the subject of rating which is furnished, in accordance with modern practice, with a short title,—its title being "The Towns Improvement Clauses Act, 1847."

1847.
10 & 11 Vic., c. 89.
" The Town
Police Clauses
Act, 1847."

Another of these model Acts is "The Town Police Clauses Act, 1847." It is an Act for consolidating in one Act certain provisions usually contained in Acts for regulating the police of towns.

1848.
11 & 12 Vic., c. 63.
" The Public
Health Act,
1848."

In 1848, the Act termed "The Public Health Act, 1848," introduced to Parliament by Lord Morpeth, was passed. By it was established the General Board of Health, of which board the First Commissioner of Woods and Forests is president. The preamble recites that "whereas further and more effectual provision ought to be made for improving the sanitary condition of towns

and populous places, and the sewerage, draining, cleansing, and paving thereof should, as far as practicable, be placed under one and the same local management and control." It authorizes the making of special district rates and general district rates as well as private improvement rates and water rates.

Another Act of the same session was passed to provide against the calamity of the cholera. It was entitled "The Nuisances Removal and Diseases Prevention Act, 1848."

11 & 12 V., c. 123.
"The Nuisances
Removal and
Diseases Pre-
vention Act."

The rating legislation of 1849 was not important, although a considerable number of Acts received the assent of the Legislature. They related chiefly to the cost of levying rates, to the distraining for highway rates, to borough rates, contribution of boroughs to counties, and to paving and lighting rates. There was also an Act for requiring annual returns of the expenditure on highways in England and Wales to be transmitted to the Secretary of State, and afterwards laid before Parliament; an Act for further amending the laws relating to sewers; and there was "The Nuisances Removal and Diseases Prevention Act, 1849," amending the Act of 1848.

1849.

12 Vic., c. 14.

12 & 13 Vic., c. 14.
12 & 13 Vic., c. 65.
12 & 13 Vic., c. 82.
12 & 13 V., c. 103.
12 & 13 Vic., c. 35.
12 & 13 Vic., c. 50.

12 & 13 V., c. 111.

It was in 1850 that "The Small Tenements Rating Act" was introduced to Parliament by Mr. Halsey. By the Act of George III., previously mentioned, known as Sturges Bourne's Act, and the Act of the previous session, power was given to vestries and overseers to rate the owners, instead of occupiers, of all tenements below twenty pounds and above six pounds, but this Act enables the vestry to declare and order that tenements of a yearly rateable value not exceeding six pounds shall be rated to the owner instead of the occupier, both to the poor rate and the highway rate; and inasmuch as the parish is benefited by the greater certainty attending this mode of assessment, the Act provides that the owner shall only be assessed at three-fourths of the amount at which the occupier would have been liable. There is moreover

1850.
13 & 14 Vic., c. 99.
"The Small
Tenements
Rating Act."

this additional bonus afforded to the owner by a provision in this Act, that an owner desirous of paying a rate for a year may compound for the same at a still further reduced assessment, not being less than one-half of the annual value on his undertaking, to pay the rate whether the premises are occupied or unoccupied. This was the origin of that compound householder who became so notorious in the recent debates upon the Reform Act.

18 & 14 Vic., c. 57.
"The Vestry
Act, 1850."

By the Vestry Act of 1850 the Poor Law Board are empowered in certain cases to prohibit the holding of vestries in churches or chapels, and with the view of making other provision for the holding of such meetings, power is given to the churchwardens and overseers to provide suitable buildings for the purpose. With a view to facilitating the transaction of parish business, provision is also made for the appointment of vestry clerks.

1855.
18 & 19 V., c. 121.
"The Nuisances
Removal Act for
England."

In 1855 was passed an Act to consolidate and amend "The Nuisances Removal and Diseases Prevention Acts, 1848, 1849." It repealed those Acts as far as they relate to England, and substituted other provisions more effectual in that behalf.

1857.
20 & 21 Vic., c. 38.

By an Act of the session of Parliament of 1857, the General Board of Health was continued until 1st September, 1858; and in 1858 was passed the statute known as "The Public Health Act, 1858," which is an Act for vesting in the Privy Council certain powers for the protection of the public health. In the same session of Parliament was passed the important Act known as "The Local Government Act, 1858," which amends "The Public Health Act, 1848," and makes further provision for the local government of towns and populous districts. Under the Public Health Act, it was necessary that the general Board of Health, the Queen in Council, and sometimes the Legislature should concur in sanctioning the adoption of the Act. Under the Local Government Act, the provision of the statutes may

1858.
21 & 22 Vic., c. 97.
"The Public
Health Act."

21 & 22 Vic., c. 98.
"The Local
Government
Act."

be adopted, in some cases, by the simple act of the rate-payers and owners of property in the locality.

In 1860, it was found necessary to make further provisions for the expenses of local Boards of Health and Improvement Commissioners acting as Burial Boards, and to amend the Acts for the removal of nuisances and the prevention of diseases; and, in 1861, to amend "The Local Government Act, 1858."

1860.
23 & 24 Vic., c. 64.

23 & 24 Vic., c. 77.

1861.
24 & 25 Vic., c. 61.

A very important statute, known as "The Union Assessment Committee Act," was passed in the year 1862, the object of which was to enforce the law of 1836, which was expressly passed to effect a correct assessment of all rateable property. It has been supposed by some that this statute makes an alteration in the principle of assessing the poor rate; but such is not the case; neither is there any alteration in regard to the persons to make the rate, the authority to allow it, the mode of its collection, nor the district for which it is assessed.

1862.
25 & 26 V., c. 103.
"The Union
Assessment Com-
mittee Act."

The provisions of the Act are that the board of guardians shall appoint an assessment committee from among themselves, which committee are to elect a clerk and to direct the overseers of the several parishes in the union to make out and forward valuation lists, in a prescribed form, for their respective parishes. The committee are to consider whether the valuations of any parishes require revision, and whether the overseers are competent to revise them. If they are not, they have power to appoint a surveyor to make a proper valuation. When the objections (if any) to the valuation list are disposed of, the committee must finally approve of it, and cause it to be signed by three members, and dated. It is then to be transmitted to the overseers, and is to be the valuation in force in any parish, except in parishes governed by local Acts.

The Act of 1862 is amended by an Act passed in 1864, in regard to appeals against poor rates, and in making

1864.
27 & 28 Vic., c. 39.
"The Union
Assessment Com-

mittee Amend-
ment Act, 1864."

1867.
30 & 31 V., c. 102.
Reform Act.

1868.
31 & 32 V., c. 109.
Church Rate
Abolition, com-
pulsory.

further provisions for securing correct and uniform valuations.

By "The Representation of the People Act, 1867," the compound householder is abolished in all parishes situate wholly or partly in a borough, and overseers are required to rate the occupier of every tenement therein.

In 1868, an Act was passed for the abolition of compulsory church rates, and by it the power to compel payment of church rates by any legal process was abolished, except in cases where money had been borrowed on the security of the church rates, and remained unpaid.

With a recital of this statute, the "Historical Notes" of Rating Legislation are brought down to the present time. To sum up the various rates, in the order in which they have been referred to, they stand as follows, viz.:—

Church Rate, practically abo-	Hundred Rate.
lished, but still compulsory	County Lunatic Asylums' Rate
in certain cases.	Drainage and Enclosure Rate.
Sewer Rate.	Lighting and Watching Rate.
Poor Rate.	Highway Rate.
Constables' Rate.	Borough Rate.
County Rate.	Police Rate.
Militia Rate.	Public Health Act Rates.
County Rate for Shire Halls.	Local Government Rates.

On some future occasion a Paper, describing the property in respect of which the several rates are levied, and the manner of valuing it for the assessment, will be very suitable for the purposes of the Institution; and a third Paper, setting forth the persons liable to pay the various rates, and the remedies which they possess against unfair and incorrect assessments, will scarcely exhaust the subject.

On the motion of Mr. H. A. HUNT, seconded by Mr. JOHN OAKLEY, a vote of thanks to Mr. RYDE, for his Paper, was unanimously passed.

AT

THE ORDINARY GENERAL MEETING,

Held on February 8th, 1869,

Mr. E. RYDE, in reply to a question, said, the reason he had not mentioned the "Poor Law Amendment Act, 1868," in his Paper was that it imposed no new rate. Mr. RYDE then promised, at the request of the Meeting, to continue the subject of "Parochial Assessments" at a future time, and any discussion on his Paper was then postponed.

The PRESIDENT said, before calling on Mr. DENTON to read the Paper of the evening, he wished to direct attention to a document issued by the Government of India, containing "Particulars respecting the selection of candidates for nomination to junior appointments in connection with the Forest Department in India." By some accident, he supposed, no mention whatever was made of English forests in connection with the training which young men were required to undergo previous to their appointment. It appeared the course was to commence on the 1st of March, 1869, and terminate in September, 1871; and those candidates who possess a sufficient knowledge of German will be directed to proceed to Germany; and, for

those who are acquainted with the French language, the course of training will be arranged in France. On the completion of the course, an examination will be held, and those who give proof of satisfactory progress will be nominated as junior assistants in the Forest Departments in India; and it was added that, "In the interval between the conclusion of the course of instruction on the Continent and the departure for India, the candidates will, probably, be required to pass some time with an approved forester in Scotland." Now, he, the President, was acquainted with almost all the large forests of England and Scotland, and could say, without hesitation, that for acquiring a general knowledge of the business, the forests of England were superior to those of Scotland, for this reason, if for no other: that hardly anything but Scotch and larch firs were grown in Scotland, while the English forests produced not only firs but oak and other timber. He saw that Mr. MENZIES, the Deputy-Surveyor of Her Majesty's Forests of Windsor, was in the room, and he would ask that gentleman, if he could suggest any action this Institution might usefully take in the matter, which he thought was one of great moment to young surveyors, who would be specially eligible for these appointments, as it appeared a preference would be given to those who obtained a certain proficiency in surveying, and the elements of chemistry, botany and geology.

Mr. MENZIES confessed that, on reading the document issued by the India Board, he felt a little hurt—not on his

own account, but on that of the surveyors of England generally. Though he was brought up in Scotland, and was intimately acquainted with forest management there, he learnt the greater part of his forestry in England. He had made long tours through the German and French forests, and he came back convinced that he need not go out of England to improve his skill in forestry. The term "foresters" was usually applied here to men who were paid 21s. or 25s. per week for managing the details of woodlands; but those who held posts of responsibility in connection with the forests, both in England and Scotland, were not foresters, but surveyors. He thought, therefore, the India Board had inferred that, because there was not a class of educated men who bore the name of foresters, there was nobody in the country qualified to give the instruction required. As the matter stood at present, the pupils of surveyors and those who had studied the profession of ordinary estate management, if they presented themselves as candidates for these appointments, however well qualified they might be, must also proceed to Germany or France in order to learn, in a foreign language, a profession which they were to exercise in British dominion. He thought it was hard upon the pupils of English or Scotch surveyors that, however qualified they might be, they had no chance of these appointments except by incurring the great expense of going on the Continent, after they had really learned their business. He should like to see a fair system of competition between those who had been trained in this country and those trained in France or

Germany; and let them afterwards be specially examined upon their knowledge of the growth of trees and botany, as well as in road surveying, making of drains, &c., which they were expected to acquire. If this Institution would organize a system, and obtain the names of a few professional men connected with the woodland districts of Kent and Sussex (than which he knew none that were better managed), or in the midland and other districts, who would give young men an opportunity of studying these matters under them, he was very much mistaken if in a short time they did not produce men better qualified for the posts, and at far less expense, than was possible under the conditions prescribed by the India Board. He thought they ought not to remain quiet under the slur that had been cast upon them in these instructions; and although, perhaps, not very much had been written on this subject in England, he questioned whether forestry was not practically quite as well understood in this country as it was in France or Germany.

Mr. J. H. LLOYD said it was very desirable that some means should be taken to remove what he believed to be a misconception on the part of the India Government, and he thought it an especial function of this Institution to move in a matter of this kind. He suggested to the Council that either a representation in writing or a deputation to the Government might be of great service.

ON
THE FUTURE EXTENSION OF THE
RAILWAY SYSTEM,
WITH SPECIAL REFERENCE TO THE INFLUENCE OF RAILWAYS
ON LANDED PROPERTY AND AGRICULTURE.

By JOHN BAILEY DENTON, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
February 8th, 1869.*

THE PRESIDENT IN THE CHAIR.

As I have neither claim nor pretensions to be an authority on railway subjects, I am afraid the Institution may consider me unfit to introduce the important subject selected for this evening's discussion; but having been connected with railways for the last twenty-five years, principally as valuer and purchaser for railway companies, whereby I have become acquainted with the details with which I am about to deal, and during which period I have been somewhat extensively engaged in estate improvements, with which I purpose comparing the advantages resulting from railway communication, I hope my remarks may be more acceptable than they otherwise would be.

Earnestly as I advocate the internal improvement of landed estates, I may at once state that, in a commercial sense, I consider that there is no improvement so economical to the landowner as that which railways secure. Whether we regard them as a means of raising the rental or income from cultivated land or woodland, or from minerals, upon

which the fee simple value may be calculated by pure arithmetic, or view them as a means of enhancing the residential enjoyment, or developing the capabilities of estates, the return from which is neither so positive nor simple, it cannot be denied that the selling value of rural property, when brought within the full influence of railway communication, is raised at least 10 per cent. above what it was in its former state, supposing all other things to be equal; and viewing this rise in connection with the means by which it has been hitherto obtained, the advantage stands in bold relief above all other estate improvements. This statement has been confirmed by some of the first authorities in the country, who have, however, always qualified their opinions by explanations pointing to the differences which necessarily regulate results.

Mr. TRIST, of the firm of Norton, Trist, & Co., states that—

“Residential Estates, for instance, brought by railway facilities within easy access of the metropolis, or other large cities and important manufacturing towns, may be increased in value, probably 20 per cent.; in agricultural estates, taken simply as investments, an increase of from 5 to 10 per cent. in value would be nearer the mark, whilst in speculative properties in favoured districts, with building capabilities, the advantages are almost incalculable, and in numerous instances they could be proved to have been increased in value at least 50 per cent., and at times to have been more than doubled in value by the close proximity of a railway station.”

Mr. OAKLEY, of the firm of Daniel Smith, Son, & Oakley, writes that—

“There are two elements to be considered in agricultural districts, viz.:—The increase in the annual rental value, and also the increase in the selling value, in years’ purchase, of the whole; I think 5 per cent. increase in rent value a moderate estimate, and two years’ purchase in selling value, which together would produce an increase of three and a half years’ purchase, or 13 per cent. In my opinion 10 per cent. may be taken as a moderate estimate of the difference in value of agricultural estates when they have good railway facilities and when they have none. In

residential estates, and in suburban districts, the increase in value is much larger; in many cases it may range from 25 to 50 per cent."

Mr. DRIVER, after pointing out the different influences which regulate improved value, says—

"Taking one property with another I should say that the years purchase of estates generally where served by railways has increased to the extent of certainly three years, and which is in some instances independent of the possibly increased rental value also given by the railway accommodation. This is my general experience, but there are special cases, within my knowledge, where farms have increased in renting value at least 25 per cent. by the facilities given for transit. Where the property is residential it has not only given the same result but it has been the means of enabling the owner to realize for the mansion a large sum in addition; in some instances quite equal to two years' purchase on a large estate."

Mr. F. J. CLARK, of the firm of Farebrother, Clark, & Co., says that—

"In an agricultural point of view the farms in the immediate vicinity of railway stations are no doubt increased in both rental and fee-simple value, arising from the facilities of exporting produce and importing manures, in rental from 2s. 6d. to 5s. per acre, and in fee-simple about three years' purchase. In a residential point of view the increase in the value of the land possessing railway accommodation is far more enhanced, though it is extremely difficult to say to what extent; but this is certain, that the chances of realizing an estate with, as against one without, are, in my experience, as about three to one."

The late Mr. CHINNOCK, in a letter to me written just before his death, speaking in the name of his firm, said that—

"Residential properties on direct main lines of railway, within easy access, are in my opinion raised in value fully five or six years' purchase; and purely agricultural estates two, three, or even four years' purchase, according to the accommodation afforded. It is not often that this increase is realized directly by selling estates, but it is so indirectly by first increasing the rental and ultimately the capital value."

Mr. WILLIAM J. BEADEL, of Gresham Street, says—

"With respect to agricultural properties, if railway accommodation can be supplied so as to bring them within easy reach of

manufacturing towns or towns of large magnitude, their value is unquestionably increased, but, I think, more in annual value than in the number of years' purchase. The difference in value reduced to years' purchase would apply to the residential and not to the purely agricultural properties. That railways confer more or less value upon all districts through which they pass cannot be disputed, and that it is to the interest of the land-owner to promote facilities of railway accommodation cannot be doubted."

Mr. VIGERS, of Old Jewry, states that—

"Railway accommodation is a primary consideration with all purchasers of estates, and also with occupiers; but the difference between an estate well served by railway and one deficient in railway accommodation is shown in the rental value, not in the number of years' purchase."

Mr. JEREMIAH MATHEWS, of Birmingham, writes that—

"In the southern and midland counties of England, the letting value is increased to an extent equal to two years' purchase upon the original selling value, and that very generally. In Wales, however, and that in almost every county north and south, the increase, so far as I am able to form a practical judgment, cannot be measured at less than five years' purchase, combining the improved value to let and the additional number of years' purchase to sell. So far, I am speaking of purely agricultural land. As regards mineral property, it is quite impossible to form any adequate notion of the increase in value by improved transit. It can indeed scarcely be said that railways have increased the value, for, in truth, they have created it."

Mr. STURGE, of Bristol, says—

"Other things being equal, I have no doubt that the difference in market value of estates, with and without railway accommodation, is at least two years' purchase."

Mr. DREW, of Exeter, writes—

"I might, however, state generally that, according to different circumstances, from 5 to 20 per cent. may be calculated as the increase in the renting value, and from two to five years' purchase in the selling value, by the advantages of railway accommodation. In districts well situated for railway accommodation, I have no difficulty in letting farms to good tenants at very good rents, or in selling land at from twenty-eight to thirty-two years' purchase. I, of course, refer to agricultural property; but in the badly situated districts, my choice of good tenants is much limited, and

the rent obtainable is likewise low in proportion, and from twenty-three to twenty-six years' purchase the most that can be obtained in selling ; whilst, in many instances, if a sale has to be forced, twenty years' purchase is more likely to be got, if you can sell at all."

Many other authorities, including several of the Members of this Institution, have kindly supplied me with corroborative evidence, showing that the improvement which landowners gain from railways, in one way or another, varies from 5 to 20 per cent., or from one and a half to six years' purchase, according to the proximity of station and the character and amount of accommodation afforded.

It is difficult to say how the increased realizable value arises ; whether from an advanced rental upon which the fee-simple value can be calculated by the number of years' purchase which rules or has been recognized in different districts, or whether, the rental being advanced, the number of years' purchase which the estate will command in the market is increased also, or whether, as in some residential cases, the number of years' purchase is increased without any advance of rent whatever. Let it arise, however, from what cause it may, I think we are justified in concluding that 10 per cent., or three years' purchase, on an average, represents the increased value of rural estates where they fully command railway accommodation.

It is no figure of speech to say that railways, where they exist, have been brought to the very door of the landowner, and the increased value stated to be the result conferred, without any contribution on his part ; and wherever any considerable property has been crossed or any part of it taken for a railway, the lucky owner has not only gained all the benefits which that undertaking has secured to himself and his neighbours while receiving payment for the land taken from him, but he has received, in addition,

compensation for compulsory sale and for the severance of that which remains, without suffering any equivalent reduction in renting or selling value. Thus the railways have not only conferred a benefit which is enjoyed by such owners in common with others, but the companies have actually, and in many cases most extravagantly, paid the recipients for the privilege of conferring it upon them; and until the tide of adversity set in, this condition of things may be said to have been the rule and not the exception.

No estate improvements with which I am acquainted can be compared to this; for if a landowner desires to drain his wet lands, or to make estate roads, or to build farm houses, or to supply homes for the labourers upon his estate, he can do neither one nor the other without an outlay of capital varying from £5 to £10 an acre, and sometimes more, the ordinary return for which, at 4 or 5 per cent. interest, he has, in many instances, a difficulty in recovering from his tenants. The intelligence of the country, speaking through the Legislature, determined, as you are aware, that the cost of such improvements might be borrowed by owners under disability, and charged upon the improved land, if repaid within a given number of years, by an annual charge of from 6 to 7 per cent.; and it is within the cognizance of many land agents present that proprietors of estates who have thus borrowed money and undertaken to repay the amount by instalments, have, in some instances, been obliged to take upon themselves a part of the annual payment,—I refer particularly to cottages,—whereby they have suffered a loss of income instead of enjoying a gain. How different is this state of things to that where a railway, by affording accommodation to the owner and tenants of an estate, raises its renting and selling value without payment of any kind, or to those cases where land is taken for the undertaking, whereby

the owner gains compensation, from which he derives an increased income over and above the advantage his neighbours gain? Leaving out of consideration building and suburban lands, of which the value has been frequently doubled and trebled, and mineral properties, the true capabilities of which railways have in many cases developed for the first time, and reverting to the value of agricultural land, with which we have now most to do, it may be stated that from 1s. an acre where the accommodation afforded by railways has been only partial, to 4s. an acre where the means of transporting produce, obtaining manure, and affording personal conveniences have been perfect, represents the limits of the farmer's benefit; and it was to secure this gain, with other advantages, to estates not yet accommodated by railways, that the Legislature, by the "Improvement of Land Act, 1864," enabled landowners under disability or otherwise, with the sanction of the Inclosure Commissioners, to subscribe to railways and to charge their estates with the amounts subscribed; and by that Act the several land improvement companies were empowered, for the first time, to advance the amount and pay it over to the railway company authorized to receive it. (*See 78th and following sections of 27 & 28 Vic., cap. 114.*) Up to this time the powers thus given have not become generally known. Still it will be to the full recognition of the principles upon which these provisions were based, that we must look to the extension of railways in agricultural districts: in fact, railways must be recognized as estate improvements if they are to be extended at all in future, now that all the principal towns have been brought into communication with each other, and rural districts only remain to be provided for.

It may hardly be necessary to adduce to you evidence of the advantages which railways afford to the owners of rural property, though, as they have now come to a complete

stand-still and can only be revived by the action of land-owners themselves, it may be well to make prominent a few facts and figures which may draw attention to the object.

The first Railway Act authorized for the conveyance of passengers was passed in the year 1821, more than 48 years ago. It was from Darlington to Stockton-on-Tees, and it was upon this railway that George Stephenson first introduced the steam locomotive, for the working of which powers were given by an Act obtained in 1823. The population of England and Wales, in 1821, was 12,000,236, and Mr. PORTER, in his work on *The Progress of the Nation*, estimated the number of persons who travelled daily, by coach and like conveyances, at 82,000 in the whole of Great Britain. The population of England and Wales, to which it is desirable to confine our attention at the present moment, is estimated by Mr. FONBLANQUE, in his Report to the Board of Trade on Agricultural Statistics, to be 21,649,377, which shows an increase of 80 per cent. in 48 years, while the desire for travelling has increased at a much greater ratio than the population itself. The number of persons who travelled in England and Wales in 1867 amounted to 250,598,982, exclusive of season ticket holders, who numbered 84,418, many of whom travelled twice a day for six days in the week, raising the daily average, according to the *Quarterly Review*, to 850,000, or upwards of ten times as much as Mr. PORTER had represented to be the travelling population in the whole of Great Britain before railways existed. To comprehend the magnitude of these figures, it should be stated, that the result is equal to a journey by every man, woman, and child, in England and Wales, fifteen times in the course of the year. From these facts, it can be well understood how the competition for land, and the demands for country occupations, are on the increase, and, as a necessary consequence, how the value of rural

property has advanced to the amount stated. The desire for living in the country, while engaged in the businesses of towns, is shown by the annual Board of Trade returns, to be vastly increasing with all professional men and tradesmen; and the suburbs of all our large towns are, consequently, extending in a manner to surprise the most sanguine advocates of railway enterprise, and explain how land, within a moderate distance of towns, has been raised from an agricultural value, calculated by tens of pounds per acre, to that of building and accommodation value, which hardly stops at hundreds. All classes of society now connect their town life with country occupations, and many of our legislators, peers and commoners, evade the expense of a house in London, and run up from the country with the members of their families, whenever parliament, court, or fashion, call them thither. It is much the same with the merchants and tradesmen of Liverpool, Manchester, Birmingham, Bristol, and all large towns. For a distance of from 15 to 20 miles the suburbs of this metropolis extend, and to get to business in London for the day, and back to the country for the night, have called into existence regular services of trains which make this amphibious sort of life easy of existence. In the morning there are those trains to arrive in London at 9 for the "Early Birds," those at 10 for the "Daily Breads," and those at 11 for the "Lazy Dogs;" and in the evening there are corresponding trains which deliver the "Early Diners" at home at 6, the "Late Diners" at 7, and the "Supper Passengers" at 8 or 9. On this point the Registrar-General tells a pithy truth. He says, in his Report for the year 1867, that "the population within the registration limits is, by estimate, 2,993,513, but beyond this central mass there is a ring of life growing rapidly, and extending along the railway lines for a circle of 15 miles from Charing Cross. The population within the circle

patrolled by the metropolitan police is 3,463,771." If these figures apply truly to the neighbourhood of London, and only in a less degree to other large towns, it is unnecessary to show how railways, having converted agricultural into suburban land, bring the more backward farms into a forward position, and thus equalize the character of properties, and raise the value of the whole. These figures, in fact, fully support the opinions I have quoted from our leading authorities, as to the extraordinary increase in value of building and accommodation land, and the less but certain improvement in farming land. To appreciate, however, the full benefit which railways confer upon agriculturists, we must again have reference to Mr. FONBLANQUE'S recent agricultural statistics, published by the Board of Trade, by which it appears that the total number of live stock in England and Wales was, in the year 1867, as follows :—

Cattle	4,013,564
Sheep	22,025,498
Pigs	2,778,672

By comparing these figures with those given in the returns furnished by the railway companies to the Board of Trade of the same year (1867), representing the number of live stock that travelled by railways in England and Wales, we find the following results, which would almost lead us to question the accuracy of the figures I quote. First, it appears that the total number of neat cattle that, in spite of the restrictive influence of the cattle disease, travelled by railway was 2,310,368, which is equal to more than half the total quantity possessed by the farmers of England and Wales; second, that of sheep, 7,171,412 travelled, which is equal to one-third of the whole number of sheep they possessed; and, third, that of pigs there were 1,389,582,

which is as nearly as possible equal to half the number that belonged to the farmers when the returns were made to the Board of Trade.

Of course, it should be understood, that in these railway returns are included all the animals imported from foreign countries, as well as the native stock which move from one part of the country to the other, and sometimes make two or three movements in a year. It would further serve to convey a true idea of the value of railways to agriculture, if the quantities of milk, potatoes, vegetables, corn and malt, brought into the metropolis, before they are dispersed or sent out again, were shown; and, perhaps, this could not be better done than in the words of a writer in the *Quarterly Review*, in the October (1868) number of which there appeared one of the most able and interesting articles yet written on our railway system.

"The Great Eastern exceeds all others in the quantity of live cattle which it brings into the London markets. During the twelve months ending the 30th June last, it brought 306,099 sheep from Eastern counties, 9,145 from Antwerp, and 35,970 from Rotterdam; 64,452 beasts; 41,900 pigs, of which 9,920 were from Rotterdam; and 3,276 calves. The same line brought, during the same period, 610,330 sacks of flour, 266,740 quarters of wheat and other cereals, and 620,551 quarters of malt, besides 38,729 tons of beer. Of potatoes, it brought to London 21,531 tons, besides immense quantities of poultry, fruit, and vegetables.

"All the other metropolitan lines add more or less to the food supply of London. In 1867, the total number of live beasts brought by railway was 172,300, and 1,147,609 sheep. Besides these, the dead meat brought by the same lines was equivalent to 112,000 more cattle, and 1,267,000 more sheep--a legion of live stock which, ranged in close columns of twelve deep, would extend from London to beyond Aberdeen. Of wheat and other cereals, the same railways brought to London, in 1867, half a million quarters, besides a million and a quarter sacks of flour and 771,034 sacks of malt.

"Of milk, the railway companies delivered 6,309,000 gallons; of potatoes, fruit, and vegetables, more than 155,000 tons, the Great Northern Company alone bringing 78,505 tons of potatoes, principally from the east of Scotland!"

I regret to be obliged to admit my inability to give any figures showing the traffic in several items of estate economy, which would display the utility of railways to the owners of land in nearly as great a degree as that afforded by the transport of human food. I refer to the carriage of minerals and timber, which are not purely agricultural, as well as to artificial foods for cattle, seeds, manures, and implements, which are so. These are included in the railway returns with minerals and general merchandize of all sorts, so as not to admit of dissection. The information, if it could be collected, would be extremely interesting, particularly with regard to the transport of machinery for steam cultivation, which, without railways, could never have advanced in use so rapidly as it has done, and which will be the means of altering and enhancing the character of those lands which hitherto have taken the lowest place, but which are destined to become the best wheat-growing lands in the country. I refer to the heavy clay lands. But, perhaps, the beneficial influence of railways in connection with agriculture has not been more signally proved, than by diverting, from water and valleys to steam and high grounds, those milling trades which had been peculiar to rivers, and which were the cause of so much injury to fertile valley land. Up to the introduction of railways the most valuable land was sacrificed to mills, on the plea that water power was inexpensive, and the value of land was small compared to the advantage derived from motive power gained by the use of upheld water. Railways have changed this view, and, although the value of water power, as a constant and natural one, must not be disregarded, it is equally certain that this abuse of rivers must be modified if it be not discontinued where the sacrifice of valuable land is the consequence.

As a set-off to these advantages from railways we often hear of the loss of land to agriculturists, which results from

the absorption of the quantity taken up by them. According to the most recent returns, the number of acres already purchased by railway companies for authorized lines open and not yet open, in England and Wales, is 121,120 acres and 37 poles. This quantity does not, however, include all the lands in the country which railways have absorbed, but only those of which the directors have made returns to the Government. The omissions form but a very small proportion. It is probable, therefore, that the total acreage in England and Wales, when the omissions are supplied, may reach 130,000 acres. This quantity includes the land in towns and suburbs. It would not be far wrong to assume that 100,000 acres have been absorbed by the railways made and making, through rural districts alone. This quantity is arrived at thus:—the length of lines already opened in England and Wales is 10,037 miles, and the quantity of land per mile has been ascertained to be 12·97 acres. Of this length I estimate that one-fifth, or, say, 2,037 miles, has passed through towns and suburbs, leaving 8,000 miles as the length passing through rural districts. If we take 12 acres per mile, including village stations, as the average mileage quantity through rural districts, 96,000 acres will be due to the 8,000 miles, to which 4,000 acres may be added for lines making. Now if we compare these 100,000 acres with the waste of land which exists all over the country, we shall see how insignificant it is. It is not many years since it was the practice with surveyors to allow 1 acre in 16 as a loss in cultivated farms of average condition, arising from waste in hedge-rows, farm roads, balks, &c., and what we now consider slovenly farming. This loss, however, is now yearly becoming less, and may average 1 acre in 20, instead of 1 in 16.

The total quantity of land under crops, bare fallow and grass, in 1867, was, according to Mr. FONBLANQUE:—

	ACRES.
In England . . .	22,932,356
In Wales . . .	2,415,139
Making a total of .	<u>25,347,495</u>

Now, if one-twentieth part of this quantity, which is 1,267,375 acres, is still wasted, or lost to cultivation, it follows that there is $12\frac{1}{2}$ times the space occupied by railways, a great part of which it is within the power of the farmer to recover and make productive, though, at the present moment, it is producing nothing. Thus the agriculturists of England and Wales have only to save from waste less than two-fifths of an acre in every 100 acres they occupy, to make up the quantity which railways, so essential to the commerce and comfort of our common country, have taken from them.

Having disposed of this drawback, there can but remain one general acknowledgment of the vast benefits which railways have conferred upon all branches of industry; yet, in spite of this, there seems to have been no limit to the demands which have been made upon railway shareholders, whereby the amount of money actually applicable to works has been reduced to a minimum.

I will now trace, in as few words as I can, the causes of the present stagnant condition of railway enterprise. They may be divided under the following heads:—

First—The heavy Parliamentary expenses which have been inflicted on all railways, more or less:

Second—The excessive cost of land:

Third—The heavy cost of railway works and maintenance, and the wasteful mode of raising capital.

PARLIAMENTARY EXPENSES.—I have endeavoured, by diligent enquiry, to arrive accurately at the amounts per mile or per acre of Parliamentary expenses which have

hitherto been incurred in obtaining the necessary Acts of Parliament, and as you would, I dare say, anticipate without any very satisfactory result. The great waste of money which attended the battle of the gauges, and the civil wars of the several dominant companies, by which they resisted the predatory acts of each other, we shall never know, and perhaps it is better that we never should. They would, indeed, present frightful figures: for, even in Wales, where aboriginal innocence was supposed to exist, I am informed, on the best authority, that on one single section of the Cambrian railways as much was spent in Parliamentary expenses as ultimately made the line!

Putting these more flagrant cases of waste out of view, it may serve our present purpose if I give the particulars of certain lines, which, by the courtesy of the secretaries of the several companies interested, I am enabled to do. The figures they present may be accepted as a fair sample of what railways through rural districts have hitherto paid in Parliamentary expenses, although it will, no doubt, be objected that the lines specified bring into communication certain large towns, and, therefore, cannot be strictly called "rural railways." To meet such objection I have endeavoured to get the same information respecting lines which are undisputably and wholly rural, and, although I have not obtained figures I can precisely quote, I have ascertained that, in most cases, they have been made bones of contention between large opposing companies claiming the territory they traverse; and that, though conceived by their promoters in the chivalry of competition or independence, have almost invariably become the property of one of the contending companies, after causing an expenditure of which the average mileage amount would probably be found to be even greater than that which the following tabulated railways expose:—

NAME OF RAILWAY.	Length in miles.	Acres per mile.	Total acreage.	Total outlay of capital.	PARLIAMENTARY EXPENSES.			LAND FOR LINE.		
					Total cost.	Cost per mile.	Cost per acre.	Total cost.	Cost per mile.	Cost per acre.
Furness Railway . . .	93	15	1397 0 0	£ 2,559,365	£ 58,579	630	£ 42	£ 159,233	£ 1,712	£ 114
Manchester, Sheffield, and Lincolnshire . . . }	246	11½	2804 1 22	12,373,978	628,690	2,555	224	827,015	3,362	295
North Staffordshire (pt.) .	123	12	1476 0 0	6,266,274	141,172	1,148	95	658,388	5,353	446
Whitehaven, Cleator, and Egremont . . . }	21	9½	200 0 0	335,000	5,740	273	28½	49,845	2,373	249
Cockermouth, Keswick, and Penrith . . . }	31½	7½	227 1 30	322,967	3,850	124	16	50,500	1,629	222
Maryport and Carlisle . .	38	12½	487 3 13	707,705	15,070	397	31	84,664	2,228	173
	552½	—	6592 2 25	32,565,289	853,101	—	—	1,729,645	—	—
Average on the whole {	—	12 per mile.	—	40,879 per mile	—	1545 per mile.	129 per acre.	—	3,133 per mile.	262 per acre.

The acreage is obtained from the Board of Trade Returns, and the outlay from the Secretaries of the different Railway Companies.

If, as I am disposed to assume, these lines of railway convey results fairly representing that part of the existing railway system which we have now in view, it would appear that the outlay in Parliamentary expenses has been, on an average, £1,545 per mile, which, for the 8,000 miles I have considered was the extent of the railways made through rural districts in England and Wales, up to the end of 1867, would amount to £12,360,000, of which the twelve millions at least would have been saved, if the Legislature had adopted, in the first instance, that course which everyone now admits would have been the best, of investigating, through a competent medium, the requirements of districts, and have pre-determined the position of those railways which were necessary.

Without further enlarging upon this point, it may be competent in me to refer to the mode in which estate and sanitary improvements have been legalized, with a view to compare the cost of the process adopted with that which has signalized the Parliamentary proceedings in connection with railways. I refer to the drainage of rural districts, the sewerage and improvement of towns, and the enclosure of open fields. In all these cases inquiries are, in the first instance, instituted under the general Acts, and the objects are subsequently sanctioned by the Legislature by means of Sessional Acts, of which there are two or more passed for each object in the course of every session. The cost of these proceedings may vary from £50 to £100, but rarely reach the latter sum; and, I think, those who take an interest in the future extension of railways, as a means of advancing agriculture, may fairly ask—why we should go to the expense of £1,545 per mile for Parliamentary expenses, which, in a line of 20 miles, would reach upwards of £30,000—while the Act for legalizing the drainage of an equal area may be obtained for less than £100. I started by

comparing the benefit derived from railways with drainage and other estate improvements, and, in the light of public utility, it would be difficult to find any very great difference between a trunk railway receiving the traffic of lateral districts not yet accommodated with railways, and for which branches are wanted, and a trunk river receiving the discharge of lateral valleys and towns not properly drained and sewered, and for which outfalls are wanted; and the analogy will appear the greater when we, presently, consider the mode in which capital for making railways may in future be raised. I will leave this part of the subject, by submitting to you the question—why should not the Board of Trade have power, through a proper officer, to investigate and report upon any proposed branch railway which, if approved by the President of the Board, may be legalized by a Sessional Act, similar to those I have shortly described? I know it may be said, that as the large towns of England are already connected by railways, there is nothing left for the existing companies worth fighting for, and that, therefore, the future Parliamentary expenses will be trifling; but past experience does not sanction this expectation, and it would be very unwise to trust to the supposition, for it is notorious that some of the worst paying lines, through agricultural districts, have involved the greatest waste of money by the opposition of competing companies, which by strangling competition monopolize districts.

COST OF LAND.—With respect to the outlay in the purchase of land, I am able to give a few more particulars, in consequence of having been very kindly assisted by the secretaries of several of the railway companies and by many of the Members of this Institution, who have had large experience in railway purchases. The following tabu-

lated statement exhibits past experiences in the purchase of several lines, which will serve as an index to the remainder. In most cases the acreage cost includes surveyor's charges on both sides, but excludes the solicitor's costs of conveyancing.

NAME OF RAILWAY.	Length.	Cost per Acre.	Authority.
Cockermouth, Keswick, and Penrith }	81½ miles	£222	Secretary
Whitehaven and Egremont	21 miles	£249	Do.
Furness	93 miles	£114	Do.
Manchester, Sheffield, and Lincolnshire }	246 miles	£295	Do.
Doncaster and Gainsboro'	17½ miles	£191	Mr. Bidwell, Company's Surveyor
Lincoln and Honington	18½ miles	£288	Do. do.
Chester and Holyhead	80 miles	£275	Mr. Fuller do.
Chester and Mold	16 miles	£300	Do. do.
North Staffordshire	123 miles	£446	Secretary
Kettering, Thrapstone, & Huntingdon }	26½ miles	£175	Mr. Denton, Company's Surveyor
Great Northern, Main Line	235 miles	{ £440, including town-lands and property	{ Secretary
Spalding and March	19 miles	£204	Mr. Bidwell, Company's Surveyor
Peterborough and Wisbeach	24 miles	£230	Mr. Fuller do.
Royston and Hitchin	17 m. 62 ch.	£190	Mr. Denton do.
Great Eastern Branches through Rural Districts }	—	£250	Mr. Adams do.
Sutton Junction	13 miles	£600	Mr. Fuller do.
Horsham and Dorking	20 miles	£200	Do. do.
Uckfield and Tunbridge Wells	16 miles	£180	Do. do.
Bognor	4 miles	£300	Do. do.
South Eastern Rural Lines, } average }	—	£300	Mr. Ryde do.
Tunbridge and Dartford Lines	—	£200	Do. do.
Strood & Bickley, L. C. & D. Ry.	20 miles	£300	Mr. Oakley do.
Alton & Winchester, S. W. Ry.	17 miles	£215	Mr. Denton do.
Chertsey Branch, S. W. Ry.	2½ miles	£380	Do. do.
Swindon and Cheltenham	—	£200	Mr. Hall
Stonehouse and Nailsworth	6 miles	£400	Mr. Fuller do.

In several of the above costs, the compensation to the occupiers is excluded.

Having regard only to those lines in the foregoing Schedule which may be called rural, and taking off from the remainder a fair proportion of the length of those in which lands of mixed character were purchased, £240 may safely be taken as the average amount of money paid per acre to landowners exclusive of the occupiers' interests. This amount, it cannot be denied, has been paid in four cases out of five, where the land would have been well sold at thirty years' purchase on its rental, without anything being added for severance and compulsory sale. The readiness with which landowners will sell their land at a very moderate cost, or even *give* it, for railways, if they cannot get them without, quite sanctions this assertion. In the Isle of Anglesea the land for the Central Railway, 18 miles in length, was purchased for £5,000, and this was done by the secretary himself applying to the landowners before any other steps were taken. Again, the land for the Ringwood and Christchurch line, $7\frac{3}{4}$ miles in length, was purchased for £1,200, or £15 an acre; and at this moment the greater part of the land for an extension in North Devon is very wisely offered for nothing if, by such means, the parent company can be induced to make it. I cannot give many instances of this sort, for, unfortunately, though great professions of liberality have frequently been made to induce the promoters of railways to make them, directly an Act has been obtained for the purpose legal reasons have been found for discarding preliminary professions, and the obligations of trustees and of persons under disability have been made the pretext for squeezing out of railway companies as much as could possibly be got. If experience had shown that the prices obtained by landowners were only such as would qualify them to make a proper abatement of rent to their tenants, the statements I have made would utterly fail in truth and fairness; but I feel sure you will

agree with me that the cases are very few in which landowners have not gained considerable profit—*i.e.*, increased income—by the sale of their land, after making such abatement as they may have made to their tenants. Isolated cases, no doubt, could be found where injury has been done for which no adequate compensation has been given; but, fortunately, they are few. In a very large majority of instances no abatement has been made to the tenant, and none has been asked beyond the simple proportionate amount per acre for the land taken,—generally calculated on the bare rent of the farm; though the inconveniences which a tenant-at-will suffers have not always been fully compensated by the money he has received of the railway company.

I am now speaking before an Institution, the Members of which have the most perfect knowledge of facts, and I would ask whether this statement is at all exaggerated? Mr. BEADEL writes, “As a general principle, I think a landowner might well afford to sell his land at its bare value, giving up all claim for severance and compulsory sale; but taking care that, so far as accommodation works are concerned, he is properly protected.” This is precisely my view of the question, and, in order that we may appreciate the full extent and effect of the over-payment to landowners, which has doubtless had something to do with the present condition of railways, and the dead-lock to which they have come, we may assume that an average of £60 an acre—*i.e.*, £2 (tithe free) $\times$ 30 years’ purchase, would have been ample payment for the 100,000 acres which railways have absorbed in rural districts. If this be so, and £240 an acre has been paid for this quantity of land, the total amount must have reached £24,000,000, when £6,000,000 should have sufficed. Hence it follows that £18,000,000 have actually been lost to the railways,

and gained by those individuals of the landed interest who have been lucky enough to possess lands required for making them. I will illustrate the way in which the landowner's profit has been gained, by three cases within my own experience, believing them to be typical of others. In one case, acting for a landowner, I was instrumental in obtaining the sum of £1,700 for $3\frac{1}{2}$ acres of land. The case was one of very bad severance, there being upwards of 250 acres of productive arable land cut off from the homestead by the railway, which crossed on a level. The abatement made to the tenant was £20 a year, and the landowner having applied the money obtained in the redemption of the land-tax, and in the purchase of additional land, obtained nearly £60 a year, so that he gained a profit of nearly £40 a year. In the next case, a Noble Marquis, now deceased, sold between thirteen and fourteen acres of land, on a branch railway (purely agricultural), at £120 an acre, for which he was receiving about 25s. tithe-free rent, and represented the proportion of the land-tax as merely nominal, while he pleaded great generosity in selling the land at the price. The railway was taken on lease, during construction, by one of the great parent lines, and though effort was made to apportion the land-tax, difficulties were found in doing so, and it was postponed until the lease was perfected: The Noble Marquis then demanded a re-apportionment of the land-tax, *ad valorem*, on the ground that agriculture was depressed, and the railway interest on the ascendant. The case was taken before the local Commissioners, and they being unable to resist the law, fixed on the railway such an amount of land-tax that, when redeemed, the price of the land purchased was raised to £175 an acre. As a large part of the land in the parish belonged to the Marquis, he, of course, gained by the increased amount apportioned on the railway. The

third case is one in which a line was promoted by the land-owners of the district. It passed through a property, under trust, for which an eminent solicitor, much connected with railway enterprise, was acting. He, being versed in such matters, opposed the Bill in Parliament, and came to terms in the committee room. I refrain from mentioning the amount agreed upon, though it was a large one, but it is certain that the tenant, from that day to this, has received no abatement of rent; on the contrary, he has re-hired the farm on lease, without desiring any reduction, being satisfied that the accommodation the railway affords compensates him for the loss of the land taken. While referring to this latter case, I am reminded of the observation of our highly esteemed friend and Associate, Mr. JOHN HORATIO LLOYD, on the evening of our first meeting, when he said, speaking of our position as surveyors, that the zeal for the interests of our employers not unfrequently warps our judgment and puts a strain upon our consciences. Now, my experience leads me to the conclusion, that though many surveyors are led in their zeal to do the best they can for claimants against railways, whose cases are put into their hands, there seldom is wanting, in the worse cases of exaction, a legal adviser who, with a full knowledge of the value of the accommodation railways afford, instructs the surveyor employed to obtain the very utmost he can, and frequently adopts the most paltry expedients to grasp it. Great reliance is placed on the disposition of juries and umpires to split differences, and it is not an uncommon practice for solicitors and surveyors so to prepare their cases, after having ascertained the very outside to which the railway company will go, as to furnish figures, in evidence, as much above the sum they really hope to get as the company's offer is below it.

Every purchaser for railway companies is alive to these

tactics, and will acknowledge that, so long as the only alternative to yielding is an appeal to jury or arbitration, with all the expense of counsel, solicitors, and witnesses, it is doubtful whether it is not better, on the ground of expediency, to succumb to exaction rather than to resist it on the ground of principle. Though exposure of the manœuvres by which money is squeezed out of companies oftentimes acts advantageously in checking for a time the greed of individuals, it cannot be denied that, on the whole, recourse to jury and, not unfrequently, arbitration, results in a lamentable failure of justice; and if the railway system is to extend, by branch lines and additional connecting lines, to those places and districts which are still without them, I think it will be found necessary to adopt a very different mode of proceeding for the acquisition of land. It is believed by many that, wherever a turnpike road now exists, a railway of some description or other should be made, and, if made at a cost not exceeding £5,000 or £6,000, will pay a fair dividend; and the Legislature, by the Act of last session, ("The Regulation of Railways Act, 1868,") delegated to the Board of Trade the power of granting licenses to construct and work *light railways*, which may be suitable for the majority of lines still remaining to be made. To reduce the cost of land, therefore, by an acceptable mode of proceeding is a primary consideration. With a view to raise a discussion on this point, I will now venture to place before you some suggestions for that purpose. I have already proposed that no payment should be made for compulsory sale nor for severance, but that a fixed number of years' purchase on the annual value, with proper accommodation works, should be the only basis of compensation when the land is simply farming land. It then remains to be considered whether the land should be paid for outright. It is the opinion of some persons that a very long

lease or easement at an annual rental, say for 999 years, such as exists in the case of the Blyth and Tyne Railway would be the better mode of acquiring land; and, if this latter plan were adopted, subject to a revision of rental at certain periods, so as to give the landowner the benefit of a general rise in value, it is not open to much objection. It would have this advantage, that many legal expenses would be avoided which appertain to the purchase of land. The question would then be, by what means should the annual value of the land be ascertained?

An opinion has been expressed that the Board of Trade, who now, in the place of justices, appoint surveyors to value for possession where any land is required by railway companies before settlement can be made, are fully competent to appoint an umpire, whose decision shall be final, to determine the amount to be paid or the rent to be fixed where the landowner or his agent and the agent of the company cannot agree; and it has been suggested that it should be entirely within the breast of such umpire to decide whether any evidence beyond that of the agents on both sides is necessary to enable him to form a proper judgment. Whether or not there should be a power of appeal against such decision is a matter worthy of consideration; but, under any circumstances, it is conceded that some such inexpensive process should regulate the future price of land for railways in rural districts, and that one and the same person should be appointed to act as umpire throughout the entire length of any future branch railway.

THE MODE OF RAISING CAPITAL.—It is not my intention to dwell much on the past, nor to detain you with “the poetry of railway financing,” as the *Saturday Review* expresses it. It is now generally acknowledged that the system of handing over to contractors the monetary powers

conferred upon railway companies by their several Acts of Parliament has had the effect of increasing the cost of works to shareholders at least thirty per cent. beyond what they would have cost had sovereigns instead of paper been the means of payment. This practice may now be considered at an end, and a very different mode of proceeding must be adopted, both with regard to the character of the works and the mode of raising the necessary capital. Upon these points there is nothing so clear as the Report of Sir ROWLAND HILL, which follows the General Report of the Royal Commission on Railways (1867).

Having already compared the improvement of a district by a branch railway to the improvement of a district by drainage or sewerage, I will now state how the general drainage and sanitary Acts enable Commissioners and Sewer Authorities to raise money for carrying out improvements.

In the case of land drainage, under the Act of 1861, recently explained by Mr. GRANTHAM, the proprietors of one-tenth of the land comprised within a proposed district can petition the Inclosure Commissioners to investigate and define the boundary of the lands to be benefited, and, by the Sanitary and Sewage Utilization Acts, one-tenth of the ratepayers within the proposed boundary of an urban district may, in like manner, petition the Secretary of State for the Home Department to fix the boundary of any district to be improved. The intended improvements, having been investigated by an inspector sent down by the Inclosure Commissioners or the Secretary of State, as the case may be, the boundary fixed and approved by them, and confirmed by Sessional Acts of Parliament, the whole of the property within the defined district becomes rateable towards the cost of the intended improvements, and the rates to be levied may be mortgaged, and money raised thereby, for the execution of the necessary works. Now, as branch railways

through rural districts are, as I hope I have shown, the most certain means of raising the value of property, there can be no reason why the same course of procedure should not be adopted. The limits of the district to be improved would be defined by the inspector appointed by the Board of Trade, and both the landed and household property within it would become security for the cost of the improvement. At present the construction and maintenance of common by-ways fall more or less directly upon land and household property, and, as Sir ROWLAND HILL points out, it may reasonably be enquired whether "the principle thus established may not be safely, justly, and beneficially applied to that better kind of by-ways by which they must, in the natural course of things, be gradually superseded." By a recent law in France the construction of branch railways has already been carried out by the application of this principle. The first essential to be secured is that the required railways shall be made as cheaply as possible, and worked economically after they are made. To apply the principle to the extension of railways in rural districts, let us assume that "light railways," such as were contemplated by the Act of last session, can be made (having reduced to reasonable limits the cost of Parliamentary expenses and the purchase of land) at a cost of from £5,000 to £6,000 per mile, including all necessary accommodation works, and that, when made, the parent companies will work them at 50 per cent. on the gross receipts, though, if the views entertained of Mr. FAIRLIE's patented improvements are sound, this proportion may be much reduced, and that applicable to dividend increased, whereby the liability of the proprietors in the district to contribute will be lessened in proportion.

The limits of the district having been defined, we may suppose, for illustration, that they would reach a mean

distance of 5 miles on each side of the intended line; so that there would be 6,400 acres per mile tributary to the railway; and all land, houses, and other property, constituting and existing upon that area, would become rateable in proportion to the benefit the railways conferred upon them. The security required to raise the capital—say £6,000 per mile—would be the power to levy a rate equal to £250 to £260 per mile per annum; which would insure to capitalists 4 per cent. upon the outlay, after paying the costs of collection. If we take an average of 9*d.* or 9½*d.* an acre on the 6,400 acres per mile run, or an equivalent of 7*d.* or 8*d.* in the pound over the whole of the district, the required rate could be raised. It does not follow, however, that the landowners, who would guarantee this annual payment, would be called upon for a single farthing; for if the traffic of the railway yielded a sufficient return to yield the required interest, after paying the parent company 50 per cent. of the earnings for working it, there would be no necessity for levying a rate, and the property within the district would, in fact, be only nominally liable for the charge. The arrangements made for mortgaging the rates *authorized to be levied* for the purpose of raising money for the execution of works, under “The Land Drainage Act, 1861,” might be readily applied to railways, subject to the same restrictions as the Drainage Act imposes, whereby the Commissioners of districts can only exercise their borrowing powers with the sanction of the Inclosure Commissioners. In the case of drainage, the whole of the land in the district is valued by a surveyor appointed by the District Commissioners, after the works are executed and the extent of improvement ascertained. An assessment is then made; and the same plan might be adopted in the case now under consideration, the assessor being appointed by the landowners of the dis-

trict. Adopting much the same principle as I have just set forth, for the provision of capital, a Bill has been this session introduced into Parliament for incorporating a company called "The Landowners' Association for the Construction of Branch Railways, and for other Works," with which an active Member of this Institution is connected.

I cannot close these remarks without expressing my own personal desire that it may not be long before the evils and contradictions of the present management of railways may be avoided by the control of the whole being placed under a special department of the state, whereby the common interests of the country are much more likely to be considered and provided for than by private companies; for, I believe with Mr. BAXENDALE, that the roads of this country should belong "altogether to the people, just as much as the light of Heaven."

Mr. J. H. LLOYD (Associate of Council) in rising to propose a vote of thanks to Mr. DENTON for his able and interesting Paper, said, although they did not sit there as legislators, the discussion of the subject would have this practical value—that the opinion of a body of men, whose occupation made them more or less acquainted with the evils of the present system, and with the value of any suggestion for improving it, must have some effect in case of any change being attempted. No doubt there had been great mismanagement and blundering throughout, both in railway legislation and railway financing. The proper function of the Legislature was to take care that compulsory powers were not given to companies without reasonable cause, and that they were exercised only for the good of the community at large; but when it chose to prescribe rules for financing, and thus impeded free action, a great mistake was made, the serious consequences of which are

felt at the present time. There was also no doubt that, both in legislation and practice, the landowner had been unduly favoured in the matter of compensation. He was unable, however, to concur in all the propositions advanced by Mr. DENTON, and hoped, at the next Meeting, to offer some further observations on the subject.

The vote of thanks, having been seconded by Mr. JOHN OAKLEY, and carried unanimously, on the motion of Mr. E. RYDE the further discussion was adjourned to the next Meeting.

AT

THE ORDINARY GENERAL MEETING

Held on Monday, February 22nd, 1869,

THE PRESIDENT IN THE CHAIR,

The discussion on Mr. J. BAILEY DENTON'S Paper was resumed by

Mr. EDWARD RYDE (Member), who said that, although extravagant claims had frequently been made against railway companies, and extravagant compensations had sometimes been paid, it did not follow that *all* landowners were extortionate. It was equally true that they had sometimes been awarded sums which were not compensations at all, while there were instances even in which railway companies had taken land and made their line, yet to this day the landowner had not been paid a farthing. He felt some anxiety that it should go forth to the world that, as a body of men, they would not look at things—even this subject of railways—from one point of view only; and that, while admitting fully the benefits conferred by railways upon land in common with other interests, they did not subscribe to the notion that, in future, railways should be formed, so to speak, at the expense of the landowners, who were to give up their land just where it was wanted, at an arbitrary price, without their convenience in the matter being consulted in any way.

He thought Mr. DENTON had overlooked the fact that land had in itself a large element of improvement; that, whether there were railways or not, the land of this country must of necessity become more valuable. The supply was absolutely limited, while the demand was daily increasing. They must, therefore, not attribute all the additional value to railways. No doubt, a large increased value was given to all kinds of agricultural land within reach of a railway station, by facilities for transport of produce, manure, and machinery; besides the development of its dormant or building value. Mr. DENTON had given authorities for putting the increase in value of agricultural land at from 5 to 10 per cent., but he (Mr. RYDE) confessed he did not know what the per centage really amounted to. He knew a light land farm, formerly, as arable land, worth 30s. per acre, which, since the making of railways, had become a dairy farm, and sent every gallon of milk produced to the London market. That had increased the value of the land at least 40 per cent. He thought, taking the general average, the increase was in rental value, not in years' purchase; because that land at 30s. an acre would have fetched the same number of years' purchase as it would now at 50s. per acre. The development of the dormant building or accommodation value of land was in some instances enormous. Land at Redhill, purchased thirty years ago for £50 an acre, had since been sold at £700 per acre. At Godstone, some small portions of land, which, fifteen years ago, were sold for £25 per acre, had realized £80,—a comparatively small increase in value, though only five miles from Redhill. This arose from the difference in the amount of railway accommodation. At Tunbridge they did not find any remarkable increase; Tunbridge Wells gave a higher rate; but, at Hastings, land that cost

£300 per acre twenty years ago had been since sold, some for £10,000, some for £5,000 per acre, and a considerable number of acres had realized £1,900 per acre, or six times its former price. At Surbiton, on the South-Western, thirty years ago the whole of the land on which that place stands was in the office in which he was brought up for sale, at £50 per acre, as farming land: now he was afraid to say what the value was. At Weybridge, land for which £18 to £20 per acre was considered a good price now fetched that sum per annum in ground rent. But, granting that agricultural land could be so increased in value, and building land also, it did not follow that all landowners wanted railways to run through their property. Such, for instance, would be the case with a man through whose land the railway cut, but who was still left remote from a station. Again, it was no satisfaction to the purchaser of an estate for residential purposes to tell him the land was enhanced in value. He did not want to sell; he had bought the estate, and wished to keep it as it was. Matters of this sort must not be overlooked.

Hard things had been said of solicitors and surveyors concerned in building estates taken by railways, but he thought they had some ground of grievance on their part. The solicitor would get a profit on every lease he granted and every mortgage he prepared if the land were not taken, and he sustained an injury by a railway going through that estate for which he obtained no compensation. It might be said he could take his skill and energy elsewhere; but his client might not be inclined to invest his money in another estate. It was no wonder such a man should advise his client to oppose the railway bill at every stage. He thought, again, that a case like that of the Surrey and Sussex Junction Railway,—where some of the land had never been paid for,

the railway half formed, and there remained in an unfinished state,—did not much commend itself to landowners, who he submitted would be certainly in a state of “aboriginal innocence” if they did not oppose such a scheme to the best of their ability.

The estimate of the quantity of land occupied by the railways, as taken from the parliamentary returns, must be considered as only approximating the truth, though it was probably near enough for their purpose; as to the lines with which he himself was connected, he knew the length and the average width, and the acreage resulting from this was what he had supplied on the parliamentary order. He further thought that, especially in the home counties, the difference between the waste in hedges, field-roads, &c., formerly and at present, was much more than the difference between 1 acre in 16 and 1 acre in 20.

With regard to parliamentary expenses, they must not forget that when the country, thirty years ago, first dealt with railway bills, they dealt with a new subject; and it was not too much to say, they did not know how to grapple with it. It was very natural that landowners, who did not then see the benefit to be derived, should oppose, through thick and thin, every proposal for driving railways through their estates. In estimating parliamentary expenses for the future, the conditions would be reversed. They all knew exactly how to go to work, and landlords understood the benefits to be derived; and, whereas, railways had hitherto been made principally for the inhabitants of towns, in future they would be made for the development of landed estates.

Passing on to the cost of the land, and sinking railways altogether for the moment, let them think how much more than the value had been given for five or six acres of adjoining land, for the mere purpose of adding them to

an estate. Three times as much as the value he had known to be given. The cost of land for railways ought to be compared with such examples as that. Then, again, looking at what was to be the fair and proper cost of land for future railways, they must just consider that a railway might be laid out through two or three estates, and very near to the boundaries of others equally benefited. Now, it was said, a man should give his land; but there was this anomaly—that those who did not give the land would derive the same amount of benefit as those who did. A better scheme must therefore be devised than that of asking landowners to give their land for nothing. They must pay the particular landowners for the land, and then have a contribution from all in respect of the benefits which they all derived. While on the question of the cost of land, he would say, that the verdicts given by juries, and, in some cases he might say, the awards made by arbitrators, gave encouragement to many of the heavy claims which were subsequently made. It was a hard thing, they must admit, for one landowner to meet the railway company in the fair and equitable spirit Mr. BAILEY DENTON wished, and then to see the next landowner, by employing a “smart” man to make a claim before a jury, get double the amount for his land. Assuming the average price of land for railways, as set out in Mr. DENTON’s Table, to be £240 per acre, he thought one moiety of that sum might fairly be put as the cost of the land itself, and the other as due to severance and other causes. That left the price of the land at £120 per acre, which he thought, looking at the forced sale, was not such an extravagant price after all, and he did not think the landowners had got so much the best of it.

Coming now to what must be the future mode of raising

capital for railways, Mr. DENTON had referred to a bill, in which he (Mr. RYDE) was somewhat interested. It was not quite determined what the form of that bill should really be, and it was withdrawn for the present. The object of it was to accomplish very much what Mr. DENTON had in view, viz:—to enable landowners to make railways cheaply, and to get legislative sanction for those railways at something like moderate cost. The scheme was this:—In order to raise capital at a low rate of interest, security in the land was given to those who advanced it, and so long as the guarantee did not exceed the benefits to be derived, nobody suffered, because the line could then be paid for in cash without financing, which made all the difference between paying a dividend and the reverse. It was suggested, that the application to the Board of Trade, of a certain number—seven-eighths or eight-tenths—of the landowners of a district should cause an inquiry to be made, in the same way as under the Sewage and Drainage Acts; and if it appeared to the officer who was sent down to make the inquiry that the railway would be beneficial, then the Board of Trade was to issue a provisional order. That provisional order would require the sanction of Parliament in some form. It was further proposed that the Board of Trade should certify the contract, in order to avoid suspicion. The railway made, the guarantee comes into operation; there would be interest on money borrowed, the working expenses to be provided for, and the payment of dividend. Supposing the net revenue were insufficient to pay 3 per cent., then the guarantee was to be put in force against the landowners, and they were to provide sufficient money to make the dividend up to 3 per cent. Supposing the receipts of the line were enough to pay more than 3 per cent. and up to 6 per cent., one-half of the profit beyond 6 per cent. was to go to the landowners as

a set-off against their chances of loss by the guarantee. Then the proportions in which the landowners should contribute was to be settled by a surveyor, who was to estimate the increased value of all the lands improved, and fix the contribution to the guarantee fund accordingly. The difficulty which stopped the bill was, how they were to get compulsory powers, which should be binding upon the dissenting minority. It was wanted to avoid the expense of a special act, and it was suggested that Lord Redesdale would allow no new bill to pass into law which took compulsory powers over entailed estates or lands held by persons under disability. If those lands were not called upon to contribute to the guarantee, of course they might be left out, and that might diminish the difficulty; but, at the same time, it might be unfair, because those very lands might receive the most benefit. Some such scheme as that must be resorted to if more railways were to be made.

He did not think, on the whole, the scheme very different from that proposed by Mr. BAILEY DENTON, viz :—a rate which would pay off principal and interest in a given number of years. The other plan was a guarantee fund, to be put in force when the railway did not yield revenue sufficient to pay the interest upon the outlay. It might be said, by such a plan a perpetual incumbrance was placed upon the land; but it was intended to make provision, that landowners should have the power of redeeming the contingent guarantee by the purchase of so much of the stock of the company, the dividend on which would amount to the dividend upon the guarantee, except when the dividend exceeded 3 per cent. That would free the land from the incumbrance whenever it was necessary to do so.

Mr. W. R. GALBRAITH (Visitor) said, that being a good deal

concerned in railways made through agricultural districts, he had read Mr. DENTON's Paper with great interest, and he thought its discussion here and throughout the country would do good, not only for railways, but to the landed interest generally. He thought landowners could hope for nothing better, as far as his experience went, than having a railway brought near them. He agreed with Mr. DENTON that the parliamentary expenses of railways had been far too much, but he thought he had not quite fairly selected the cases of railways in agricultural localities. The North Staffordshire and Manchester, Sheffield, and Lincolnshire could scarcely be placed in that category, and the estimate of £1,500 per mile for parliamentary expenses was far beyond what they would see now for railways in agricultural districts. As an extreme case the reverse way, they found the parliamentary expenses of the Cockermouth and Keswick line were only £124 per mile. If that included the preparation of parliamentary plans and legal expenses, it was probably the cheapest bill that was ever carried. Then there was another matter which he thought required amendment, that was the Standing Orders, inasmuch as they were frequently an instrument in the hands of large companies for oppressing small projectors. He had himself assisted in throwing out schemes upon some very trivial points indeed; and he thought the policy of the House of Lords especially seemed to be rather to check railway enterprise than to encourage it. Two or three years ago, perhaps, a wholesome check was required, but at the present time they required encouragement rather than opposition. It was, however, of no use for engineers to talk about that. If they were to do any good in respect of future railways, the question must undoubtedly be taken up by the landowners themselves, and this body of surveyors, who mainly represented

the landed interest, must also take it up, and press it upon the landowners. As to the cost of land, he would mention one or two cases on a line constructed by him, which passed through a property for the length of $3\frac{1}{4}$ miles. The land was very poor indeed; he (Mr. GALBRAITH) should have thought £10 per acre was about the proper price, but a surveyor valued it at £20. The price actually paid for that land was £125 per acre, or four-and-a-half times its agricultural value. The tenants told him they had received no abatement of rent. The company bought about 38 acres of this land, and the result was, the owner put about £5,000 into his pocket. In the centre of this property the company had to construct a station. He believed he was within the mark when he said that this property was raised in value by two years' purchase; if so, the rental value of the property being about £4,000 a year, besides the £5,000 paid for the land, the property itself was improved to the extent of £8,000. After squeezing this money out of the company, the gentleman took them before the justices in reference to accommodation works, the result of which was, in the $3\frac{1}{4}$ miles, they constructed no less than fourteen crossings, or about one in every quarter of a mile, so that there could not be said to be much severance there. He was glad to say, for the honour of this Institution, that the extortion was perpetrated by a solicitor, and not by a surveyor. The next case was on the same railway, and on property nearly to the same extent, within a few chains. There the agricultural value of the land was put at £42 per acre, but the company paid £130 per acre; and he believed there was a small abatement of rent to the tenants in that case, but the great bulk of the money went into the landowner's pocket. In that $3\frac{1}{4}$ miles of railway they also made fourteen crossings, so that there again there was not

much severance. He had painful recollections of the dealings with other landed proprietors in the district. And if railways were to be made cheaply for the future, he agreed with Mr. DENTON, that a binding agreement for the price of the land must be come to before the Act of Parliament was obtained.

The subject of light railways had been mooted by Mr. DENTON, and he (Mr. GALBRAITH) was certain that railways might be made through agricultural districts for £5,000 or £6,000 per mile. But there was this to be said, that pressure must be brought to bear upon the Board of Trade, to assist with level crossings of public roads. This was a thing which had pressed heavily on railways in agricultural districts. As sure as they went to the Board of Trade with a level crossing, so sure were they to have a report against it; and in such a district as that he had referred to (Devonshire), where there were many small public roads, they had to build bridges over or pass under the road with bridges, which increased the cost per mile to such an extent that they could not possibly make railways at a cheap rate. He submitted that where there were only three or four trains per day, level crossings, with persons appointed to open the gates, were no impediment to the traffic.

One point must be guarded against. He would not thank a landowner who gave his land for nothing, and insisted upon large accommodation works. There must be an agreement to take some moderate accommodation works, and, as a rule, they must take level crossings, because it was obvious that a cheap railway must be near the surface. There might be cases of large dairy farms, where cattle arches would be required, but the ordinary traffic must be taken over on the level crossings.

He thought the suggestion of leases for 999 years

good, as it would save the large expense of conveyance ; but he did not understand the principle on which the land should be revalued from time to time.

He thought too much had been said about contractors' lines by those who did not understand the question. The very fact that the large majority of contractors who had dabbled in so-called contractors' lines had come to grief, showed that, as far as they were concerned, they had gained nothing by the business, and the state of the finance companies showed that the profits had not gone into their pockets. It might be that the small sum subscribed in the district was lost, but the landowners had the benefit of the railway, and they were amply repaid. Therefore, if more railways were to be made, they must be carried out in some such mode as Mr. DENTON had suggested ; and he was glad to hear Mr. RYDE, to a great extent, coincided with it. He would, in conclusion, give them a case in point, showing that lines could not be carried out now without some assistance other than they had. He was the engineer of a line called the Bude and Torrington, which ran 40 miles through an agricultural district, but with a fair traffic. The railway could be made for £7,000 per mile. There was a working agreement with the South-Western Company to work the line at 42½ per cent. of the receipts, and the Bude Company were to receive a rebate of £3,000 a year for the traffic they threw upon the South-Western line. He had put the cost of the line at £300,000, he took the traffic at £10 per mile per week, and adding the rebate of £3,000, the net returns would be £15,000 a year, which would pay 5 per cent. upon the capital expended. What had they got from the district itself? About half the landowners had given their land, and the district had subscribed about £20,000 out of the

£300,000. The result was, if some further effort was not made, the act would be lost, and that agreement would never be renewed by the South-Western Company.

MR. CHARLES DOUGLAS FOX (Visitor) would confirm the remarks of his brother engineer (MR. GALBRAITH) with reference to the great importance, if railways were to be made economically, of obtaining some fresh powers for dealing with level crossings. A line to be not only economical but serviceable to the land must be a surface line sufficiently strong to take the ordinary rolling stock of the main line, except the locomotives, and to be worked at a speed of twenty or twenty-five miles an hour. If it were intended to serve farming interests, deep cuttings must be avoided, so that stopping places may be put in for each large estate. He quite agreed with MR. RYDE, that the value of a railway to a landowner was not much when his land was at a great distance from a station. As an example of the saving to be effected by a lighter form of construction, he would give the cost of an ordinary branch line, constructed by himself, through a purely agricultural country. The Act of Parliament was applied for in the usual way. The line was made by a contractor, part payment being in paper. The total cost of the line was £8,649 per mile, of which parliamentary expenses were £341, land £930, works £5,834, law expenses £325, engineering £279, management, interest on loans, &c., £940,—making a total of £8,649. The same description of railway could now be constructed for about £4,000 per mile, made up in this way:—Preliminary expenses £60, including cost of application to the Board of Trade under the Railway Facilities Act; land £600 (the quantity of land per mile not exceeding five acres, at £120 per acre); works £2,919; law expenses, engineering and

management £500 = total, £4,079. The result was this—The gross revenue was £11 per mile per week. The line was worked by the parent line at 50 per cent., and, deducting other expenses, it left a net revenue of $2\frac{2}{3}$ per cent.; but three-fourths of the money being borrowed at 5 per cent., the dividend was almost absorbed, and the shareholders got no returns. But if, on the other hand, the line had been made for £4,000 per mile, the net receipts would, on the same traffic, be $5\frac{5}{7}$ per cent. on the capital; and, if $\frac{3}{7}$ of the money had, as before, been obtained at 5 per cent., the dividend on the ordinary stock would have been over 6 per cent. This, he repeated, was a fair average line, and he had taken the same prices for works in both cases. What they wanted was a similar plan to that which they had in America—viz., surface lines, worked by accommodation trains—in other words, branch lines with more frequent stations than there were now, or, what would be better, stopping-places or sidings for the more important farms or estates situate on the line; and this did not of necessity involve facing points. He brought this forward because he felt the Members of this Institution, and those of the Institution of Civil Engineers, should combine together to carry out a necessity of the country—and, as they had already made the great trunk railways, they should now, upon a new system, make the branch lines, and not allow a large quantity of land to lie comparatively unproductive. He believed the money would be readily obtained for the purpose, if only proper facilities for the making of these branch lines were afforded.

MR. THOS. WEBSTER (Visitor) believed the time was past when the public or contractors would make railways; and, he thought, if landowners would consult their true

interests, they would find out a way of making them for themselves. He considered landowners had been most extortionate in their demands, and they ought rather to have given the land, and have done all they could to promote railways in their districts. He believed, most firmly, that light railways could be made economically under the act which was passed last session. Mr. BAILEY DENTON's principles were, he thought, the true ones, and worthy the attention of Members of this Institution, who, as advisers of the landowners, possessed an opportunity which no body of men ever had before of holding the balance between the landowners and the public, and deciding what should be the proper consideration to be given and taken for the various advantages conferred.

SIR CHARLES FOX (Visitor) called attention to what he considered a difficulty in "The Improvement of Land Act, 1864," *viz.*, that the land could not be charged with the rate till the works were completed, and the funds necessary for carrying on works in progress could not therefore be readily collected.

Mr. J. H. LLOYD would just mention, that the provisions in "The Improvement of Land Act, 1864," referred to by the last speaker, originated with the Lands Improvement Company, who sought to introduce them into their own private act. LORD REDESDALE, who had a great objection to private bills, suggested, that if such a measure was good for the Lands Improvement Company, it would be good for the country generally; and he (Mr. LLOYD) was, accordingly, instructed to prepare, and did prepare, the public bill. He did not believe there was any difficulty in the working of the act, and that it had not been availed of he thought

must be chiefly owing to a want of combination on the part of the landowners.

Mr. THOMAS HUSKISSON (Member) remarked, that land was not the only description of property that had been benefited by the construction of railways. The manufacturer—placed wherever he might be, had not the extent of his business been developed by the construction of railways throughout the country? Then, again, taking the case of the professional men, was there any class who had been more largely benefited than their own profession? Yet it was not proposed that they should surrender any part of their property for the further construction of railways. He regretted the almost personal tone which this discussion had assumed; the real question was, whether they could suggest some means by which these vast expenses might be avoided, and those obstacles now operating to stop railway enterprise removed. That was the only broad view on which it became this Institution to discuss the question, and on that point he would say, the suggestions contained in Mr. BAILEY DENTON's Paper appeared to him extremely valuable and deserving their most serious attention. Time was when a special Act of Parliament was necessary for enclosures and drainage. That was now avoided; and he saw no reason why the same facilities should not be granted in the case of railways. By that means parliamentary expenses and other preliminary costs would be brought within very small limits. The assessment of compensation was a delicate subject, and it might be worth while to consider whether some improvement in the machinery might not be adopted for determining the amount to be paid. In France, the compensation was assessed by a public officer. He subscribed to the principle, that the majority should have power to

control the minority, and while he would preserve as far as possible individual rights, he was quite aware that in every district there were a number of ignorant, obstinate, and indifferent people, who, unless there was power to control them, would always be ready to oppose any useful and beneficial undertaking, whatever it might be. He did not deny that many landowners had received large compensations, nor that they had received more than they were reasonably entitled to ; but he did not think that compensation paid, either by private agreement or by the awards of arbitrators or juries, entitled them to speak of the persons receiving it as plunderers or extortioners.

Further discussion was then adjourned to the next meeting.

AT

THE ORDINARY GENERAL MEETING

Held on Monday, March 8th, 1869,

THE PRESIDENT IN THE CHAIR,

The adjourned discussion on Mr. J. BAILEY DENTON'S Paper was resumed by

Mr. J. W. BARRY (Associate), who said he did not see much to find fault with in the landowners up to the present time. They had often been induced to go into abortive schemes, and had been saddled with costs which they had never contemplated. He thought in the Paper itself, and in the discussion, the subject had been looked at too much from one point of view, viz., the benefits which land had derived from railways; but the public advantages, whether of trunk lines or branches, ought not to be passed over. They must not shut their eyes to the fact that railways were gradually superseding other means of communication throughout the country. One speaker compared the trunk lines to turnpike roads. He would compare the branch lines to the parish roads and bye roads of the country, which were most valuable as bringing produce to the turnpike roads, and feeding the country far and wide. Though landowners were primarily interested, the subject must be regarded in a more general way than as mere additional value

given to the land, and he thought in the first place it was not reasonable to ask landowners to give their land for the railways, because contiguous property would be as much benefited as the estate through which the railway ran, and often more so; nor ought landowners to be called upon to take shares to the extent some thought they should. Mr. GALBRAITH thought one portion of a county ought to subscribe for something like £300,000 of shares, but that was not a reasonable expectation, or one likely to happen. It was out of the power of many to take shares; others were tenants for life and under disabilities; therefore he thought that reliance on any such notions as those to which he had referred was trusting to a broken reed; but a moderate guarantee upon the cost of the railway, if the line was economically made, was both reasonable and feasible. No doubt there were difficulties in the way of such a proposition. That of disability might be got over by some of the acts recently passed; want of unanimity might be met by regarding branch lines as of public utility as well as of private advantage; and a limited amount of compulsion might be sanctioned by Parliament where the percentage of dissentients was small. The apportionment of the guarantee would have to be dealt with by gentlemen of this Institution conversant with the facts of the case. The great question with regard to these branch railways was whether the cost of construction and the contingent expenses were large or small; and everything connected with the first cost must be strictly scrutinized. The first thing which tended to enhance the cost of railways, undoubtedly was the requirements of the Board of Trade. At the present moment the Board asked for bridges and accommodation works of such a description as he thought in many cases was scarcely justifiable, inasmuch as level crossings would in many instances

be sufficient for the traffic ; and he submitted, that where expensive accommodation works were demanded, the district ought to contribute towards the cost of them. He did not think it of much consequence whether the land was bought or dealt with by rent charge. Rent charge was perhaps the most reasonable way, and would no doubt tend to diminish the difficulties of first starting a railway. In contemplating the cost of a branch railway, it must be remembered that the permanent way would always be a large item, and could not be reckoned at much under £2,000 a mile. There was at the present time a good deal of talk about light railways following the contour of the country, and made with inexpensive works ; but it seemed to him if a railway was to follow the contour of the country it must be with heavy gradients ; these could only be surmounted by heavy engines, and the permanent way must therefore be heavy also, and consequently expensive. There were further difficulties as to junctions with existing main lines and stations, and arrangements for working, and the old companies, because they were strong, were apt to drive hard bargains. He thought in any general scheme, the old companies might be compelled to afford reasonable facilities to the branch lines in connection with them. This brought him to the working expenses of branch railways, and he protested against reckoning the working expenses generally at 50 per cent. It was a rough and ready way of reckoning which he thought would not hold water. In some cases it was much more, and in some less. Another question was the rebate on the traffic which branch railways brought to existing railways. These were all matters of negotiation between the companies ; and, frequently, this negotiation was not fair to the new company. What they chiefly wanted was the means of getting railways made under the

advantages which always attend cash payments for the work without the evils of financing; thus, for every shilling spent they should get twelve pennyworth of work. They wanted an equitable adjustment of the burdens amongst the landowners and the public, and also a certain amount of compulsion upon landowners for making the lines, and upon existing companies to afford facilities for making and working them. He thought that was the direction in which the consideration of this subject should tend.

Mr. J. H. LLOYD (Associate of Council) did not agree in all that had been said in disparagement of the landowners, much less did he approve of the energetic strictures passed upon them by his learned friend, Mr. WEBSTER, on the last occasion. Great excuse was to be made for that body of men. In the first place, their minds were not particularly receptive, and, in earlier days, an invasion of their estates by a railroad was looked upon as something horrible; while the promoters were regarded as speculating adventurers, working only for their private ends. A committee of the House of Lords was appointed to report on these matters, and they suggested that, after giving the utmost value for the land, 50 per cent. should be added on account of the compulsory sale. He had no doubt the feeling then really was that a great injury was inflicted, and that the thing of all others to be done by owners of land was to keep the railways away. He, however, could not help thinking his friend, Mr. BAILEY DENTON, on the question of cost for compensation, had gone a little too far. When he said landowners ought, in all cases, to give their land for the acreage value capitalized, he (Mr. LLOYD) could not agree with him. No such rule, rigidly laid down, could be acted upon, because there were cases in which one landowner would be prejudiced by the

cutting up of his estate, while others would be benefited without that special detriment. Again, to lay down an inflexible rule that landowners ought not to ask for compensation for the compulsory taking, would be, to his mind, as inequitable as the other, because instances did undoubtedly occur where the present value, based on actual rental, would not adequately represent the prospective value, and because some regard ought certainly to be paid to the cost and inconvenience of a change of investment. The question had been often raised, "Should you not set off the advantage the landowner gains against the injury he sustains by the severance of, or interference with, his land?" But the Courts said No: for the plain reason that the benefit is common to others who do not suffer the injury, and that it is impossible to deny that the severance of an estate is in itself a detriment, and detracts from its value. There were instances, no doubt in former times, in which landowners had been extortionate, and it was much to be regretted that men in the position they occupied should have taken that course; but that was no argument for holding that they were in the present day justified in asking landowners to part with their land at the bare agricultural value, without regard to severance.

They were all agreed that railways in the stead of roads were a thing to be desired. The conveniences of railroads over ordinary roads were, in the present day, undoubted. The old system of carting the produce of a farm was obsolete in principle if not in practice. Then came the questions which Mr. BAILEY DENTON brought before them in order. He agreed with Mr. DENTON that if they could supersede the present mechanism of a special Act of Parliament by a simple process, it would be exceedingly desirable to do so; but he had thought over it much, and he did not quite see

the particular way in which it could be carried into effect. He was sorry it was so ; but, as a lawyer, his mind was naturally to a certain extent technical. Mr. BAILEY DENTON argued that it was done in the case of drainage and improvement of land, and said the analogy was perfect, because it was as important to have communication into the land as to have the land itself drained. True, but they could not form a district railway board for that purpose, nor did he see how it was practicable to rate the land for railways as it was for drainage. Mr. RYDE told them he had a scheme of his own, which, no doubt, was in principle a good one. Mr. RYDE said, "Form a general company, which shall take up this question of landowners' lines ;" and, by some process, the landowners were to guarantee a certain rate of interest upon the subscription, which guarantee was to be secured upon the land. Now, he (Mr. LLOYD) saw a good deal of practical difficulty in that scheme also. He would not go into legal questions, which would weary the meeting, but they would give him credit, as an old experienced railway lawyer, when he told them that, to his mind, difficulties did present themselves.

Then there was the Act passed in 1864, to which allusion had been made. Amongst other things, it provided that landowners might charge their inheritance in the estates for 25 years with a rent charge, for enabling them to subscribe towards these railways. For that purpose, a provisional order would be obtained, which might be taken up by The Lands Improvement or Land Drainage Company, or some other such body ; then, when the railway was completed, there was to be an absolute order, charging the land and the inheritance with this rent charge. But if, under such circumstances, they applied to the Lands Improvement Company, or the Land Drainage Company, that company

would say, "What security have we that the railway will be made?" They would not advance the money *ad interim*; and the landowner, not finding it convenient to lie out of the money till the railway was completed, that act had failed. Besides, in looking through the act he found it so full of embarrassing details that he did not see how it could ever work satisfactorily. Lord Redesdale had evidently had his finger in it, and had smothered it with technicalities. Indeed, that noble lord had always had the notion that a railway undertaking was a thing to be put into swaddling clothes, and its arms and legs bound fast. For example, he laid it down as an inflexible rule that there should be no interest paid upon capital during construction; and that, in the case of borrowing of money, every kind of protection was to be thrown round the borrower. Now, he would venture to repeat here what he once said before a Parliamentary Committee—that, what they wanted from the State, was power only to construct the railway and levy tolls. What had the State or the Legislature to do with the financial matter?

There was another Act of Parliament which he thought a very useful one—that was The Lands Clauses Consolidation (Ireland) Act. It was a general act, and it enabled this to be done:—A company being formed for the purposes of a railway, instead of going through the process they did in England, an arbitrator was appointed by a public body, before whom the plans and estimates for the railway were laid, and he was empowered to value the interests and property required for the construction of the line, and to assess all the compensations, and to determine all questions of accommodation works. To this sole arbitrator power was given to hear evidence of parties relative to their interests and property. Having done this, he made a draft award,

applicable to the whole, or to one or more districts of the whole. That award was published, and the persons interested were invited by public notice to state their objections to such award, and, after hearing and determining the objections, the final award was made. This was a system which, he was sure, would commend itself to the Members of this Association; for it got rid of the lawyers, but left the surveyors. (*A laugh.*) He thought, for carrying out the simple arrangements necessary in an agricultural district, nothing could be better. The same act, however, gave power to those who were dissatisfied with the final award to traverse it, and have the issue tried in a superior court. That would seem to be by way of a sop to the lawyers, and was the great blot of the whole thing. He thought if some such simple machinery as this (leaving out the appeal) were adopted, it would tend to facilitate the construction of the class of railways which they were now discussing.

Then, as to the engineering part, he had no doubt the important discoveries of Mr. FAIRLIE, properly applied, would be useful in cheapening the cost of construction and working. There was no such thing now as an impossible gradient, or an impracticable curve. He had himself seen that extraordinary little railway from Port Madoc to the slate quarries in Wales. The line was carried by a sinuous course to the top of the quarries, and the apparatus by which it was worked was of the simplest kind. In some such way as this, he imagined, engineers would be able greatly to reduce the cost of railways; and if, in addition to that, the cost of obtaining authority for the line and the compensations could also be materially reduced, the problem was solved.

Regarding it as within the province of this Institution to

suggest useful improvements, he thought the best thing to do was to appoint a small committee to consider what would be the best mode of carrying out this desire they had of facilitating the construction of railways in agricultural districts, and to suggest to the Government what might be done in furtherance of this object; and he would recommend that the co-operation of the Institution of Civil Engineers should also be invited. He thought these Institutions ought not to exist merely for the benefit of the individual members, but for the public good. He believed he was warranted in saying that, in the present constitution of the Board of Trade, there was never so favourable an opportunity as now existed for the bringing forward of useful measures.

Mr. FRANCIS VIGERS (Member) remarked, it was quite clear that the landowners had benefited by railways more than those who had taken upon themselves the burden of constructing them. Whether they had been paid too much for their land or not it was no advantage now to enquire. If promoters, for their own purposes, constructed railways in the face of a strong opposition, and were willing to pay high prices for land, why should not the landowners take the prices offered, and get the advantages besides? He thought almost every other class of society would have done the same. But, passing that by, and supposing railways to be more beneficial to landowners than to other persons, in future they must be made either by the landowners themselves, or with their assistance, instead of, in the face of opposition by them. It occurred to him that it might be of advantage if surveyors, instead of being called upon to make estimates of the land shown on a plan already deposited, should go over the line before it was made public, and enter into negotiations with the various landowners, with a view to getting

their support, and fixing, as far as they could, the price to be paid for the land. In all cases, no doubt, they would meet with some obstinate man who would stand out for better terms ; but there was a moral influence which landowners knew how to bring to bear upon their neighbours which would assist the surveyor ; and by early negotiation the purchase of the land would be effected at something like reasonable cost, and Mr. GALBRAITH's point—that the accommodation works put on the railway company should not be extravagant or unreasonable—would be secured. He thought by such a plan of preliminary negotiation many of the evils now complained of would be remedied.

Mr. E. J. SMITH (Member) thought that in almost every agricultural district, the formation of any new schemes would in future depend to a great extent on the efforts of the landowners themselves. That being the case, the concurrence of the shareholders and directors of the existing railways was a most important element : and that had not been mentioned. It was their interest to secure as much traffic as they could. It was to the interest of the owners of the area to obtain the egress ; and if the owners in the aggregate guaranteed to the existing railways a reasonable percentage on the cost of the branch lines, the whole thing, he apprehended, would be done. That, he thought, was the end to which their exertions should tend. The only mode he could see of carrying out such schemes generally, was for the owners, in the aggregate, to guarantee interest to the existing companies, to whom they held out an increase of trade on the main line.

Mr. T. MARR JOHNSON (Associate),—referring to Mr. VIGERS' suggestion, that surveyors should accompany the

engineer over the ground of a projected railway,—would state that he had seen many railways laid out, and scarcely ever knew it to be successfully done without the help of a surveyor. And he could state, from personal experience, that in the laying out of the Metropolitan and Metropolitan District Railways, the engineers were very much indebted to the assistance of the surveyors; in fact, when laying out railways through costly property, their co-operation was essential. He hoped the proposition of Mr. LLOYD would be acted upon. He did not know whether Mr. DENTON had entire confidence in the way he proposed to raise the funds, *viz.*, on the same principle as in the Act of 1861, as he understood him to say that act had been comparatively a failure. He did not imagine that all landowners could be expected to give their land; for though it might answer the purposes of large owners to do so, in the case of small proprietors it would be tantamount to giving up all their property. He thought something was to be conceded on the part of the public, and one of the first things to be given up was the present high speed, which was inconsistent with the construction of light railways, involving heavy permanent way, heavy engines, and heavy wear and tear, and, consequent high cost of working. It was an acknowledged fact that the wear and tear of road and plant varied as the square of the speed of the trains, and in some cases approached even to the 3rd power. Mr. LLOYD had referred to a two-foot gauge railway in Wales,—and there might be a few cases such as this where it was expedient to adopt an exceptionally narrow gauge, as would be the case of a line in connection with a large system of tramways. But he believed as a rule they must adhere to the national gauge, or that of the main lines, with which the light railways would connect. He did not think there was so much

economy in the construction of very narrow gauge railways, as was generally supposed, and cited the case of the Festiniog railway: Capt. TYLER, who read a Paper on that railway before the Institution of Civil Engineers, gave as his opinion, that 12 ft. bridges were requisite even with the 2 ft. gauge, whilst 13 ft. bridges were usual with the ordinary narrow gauge rolling-stock. Side doors being indispensable in the back-to-back seated carriages on the above railway, no doubt necessitated the bridges being 12 feet wide; but side doors could be dispensed with on the ordinary gauge, and if carriages similar to those on Rammel's Crystal Palace railway were used, both locomotives and carriages would pass through a 7 ft. opening. The over bridges might, therefore, be considerably less than 12 ft.; no more land would be taken than for the 2 ft. gauge, and no heavier rail required, and the steadiness would be much greater. He thought the light railways would resolve themselves into two classes—one adapted for a flat country, like Cambridge-shire, where the curves need not be sharp, and where lines would be practically level, without over bridges, and on which the rolling-stock of the main line could travel with ease, the locomotives excepted. The second class of railways would be those in hilly countries requiring steep gradients, sharp curves, occasional over bridges, and special working plant—carriages as well as engines; but in both cases they must be on the 4 ft. 8½ in. gauge, if for no other reasons, because it was most important in working railways economically that it should not be necessary to have separate establishments for repairs, &c.; the rolling-stock could then pass to the repairing shops of the parent company, or over their railways on the way to other shops, and the usual evils of a break of gauge would be avoided. Moreover, he ventured to think that as light railways of the more special class

became numerous, to that extent would the stock of the parent line be adapted to them; it could be so adapted without detracting from its efficiency to work upon the main line. There was one thing they must be careful about, that was, not aim at making through lines, otherwise they might meet with opposition from the existing companies, which would entirely prevent the construction of the railways contemplated in Mr. DENTON's Paper.

Mr. LLOYD, *à propos* of the last remark of Mr. JOHNSON, said, in the case of the Northumberland Central Railway, all the difficulties met with arose from the attempts to make it a main line. If it had been confined to a local line no difficulty would have been experienced. There was a hint to be taken from that case in the consideration of this question. The Northumberland Central Company proposed to make the line in sections to be opened as completed. The history of that railway was a very curious one. They had been trying for ten years to make it a through competitive line, and that had caused all the difficulties. Now, at the last moment, through the munificence of the DUKE OF NORTHUMB-ERLAND, they were about to complete the line, but as a local line only.

Mr. J. BAILEY DENTON observed that very little remained for him to say in reply, particularly if it was likely to be followed up by Mr. LLOYD's suggestion of a committee to consider the subject. Mr. RYDE gave his opinion that £240 per acre for land—one-half that sum being in respect of severance, and the other the price of the land—was not an extravagant price, and that he did not think the landowners had got so much the best of it. They must, however, look to the future, and he said this—if railways were to be

made, as he hoped and believed they would be, at something like £5,000 per mile, including purchase of land, and they had to pay £240 per acre for the eight or ten acres required per mile, it would absorb £2,000 out of the £5,000 for land only, and that would veto the thing at once and prevent the making of further railways. Mr. RYDE had made a playful criticism on the expression "aboriginal innocence" used in the Paper with regard to the prices paid for land in Wales. Now, he held in his hand a letter which he had received from a gentleman who did not wish his name to be mentioned, in which it was stated that £600,000 was paid for 2000 acres of rural land in Wales. The writer pledged himself to the truth of that statement, and that brought the price of the land to £300 per acre, or £60 per acre above what he stated as the mean price of land in the instances he quoted. The "aboriginal innocence" of the Welsh proprietor was scarcely upheld in that case. With reference to the observations of Mr. GALBRAITH, that the instances quoted in the Paper as to the parliamentary expenses were not apposite, because they related to lines running from town to town, and could not be regarded as rural lines, he (Mr. DENTON) would say, the selection he had made gave a favorable average; for he found, if he had taken as many lines purely agricultural, the parliamentary expenses on the average of such cases would be in excess of those which he had quoted. He had nothing further to add, beyond expressing his gratification at the practical result which was likely to attend the introduction and discussion of this important subject.

Mr. R. C. DRIVER (Member) mentioned a case within his knowledge in which the proprietor received £10,000 for supposed damage to his residential property. The estate

was afterwards sold, and it realized an amount far beyond what was thought to be its original value,—upon which the proprietor rendered back to the railway company the £10,000 received.

THE PRESIDENT said, that in the purchase of land for a certain railway, he had been obliged to pay £300 per acre for land that was not worth £30, because it was alleged that the railway would frighten the nightingales out of the wood. Some very strong terms had been applied to landowners in respect of their dealings with railway companies; but, in his many years' practice, he found that they were not the only plunderers. He had a case with one of the railways in the neighbourhood of London, in which he sold $2\frac{1}{2}$ acres of land to the company for £900. Only one acre was used for the railway, and the company demanded £1,250 for the remaining $1\frac{1}{2}$ acre: so that, it would seem, the gentlemen who were loudest in their complaints against the landowners, when they became landowners themselves, were more exorbitant in their demands than the persons they complained of. In these, as in all other matters, he thought human nature would be human nature to the end of time. A man who had anything to sell would get the best price he could for it; and the man who had to buy, would get a thing at the lowest price he could. It was a fallacy to think otherwise. It was asserted in the Paper that very few landowners had made abatement of rent to their tenants in consequence of land taken from them for railways. That was a very unsound argument, because, in most cases, it was well known that the occupier of the land was not rack-rented. The owner might have been lenient with him, and the land having been taken out of a farm under-rented, the tenant, not desiring to disturb the existing arrangement

with his landlord, had not asked for abatement; but to suppose that one acre out of two should be taken without abatement was absurd. On the subject of landowners being required to give the land for the railways, he would say he did not at all agree with it. A case might occur in which a man under such circumstances might be called on to give away his all. It depended upon the size of an estate, and a variety of circumstances which they could not control. He did not see for his own part why this sacrifice should be expected exclusively of the landowners. They were not the only persons interested in, and benefited by, the railways. What had brought England to its present state of prosperity? How was it they saw tons weight of letters and newspapers sent off by the railways? Who benefited by that? The farmer certainly did not benefit exceptionally from this great mass of information daily transmitted throughout the country! It was for the general benefit of the country that railways should be constructed. He admitted the chief towns and populous districts were, to a great extent, supplied already with the means of communication. The question now was, how they were to reach the districts which were not supplied. It appeared to him that the discussion had taken the only practical form it could,—that was, that some scheme must be devised by which the sanction of the Legislature could be obtained, without the great expense which heretofore attended it. He could not conceive why acts should not be as readily passed for railways as for enclosures of wastes and the drainage of land. They might embody in that act any other act, though he thought the Lands Clauses Act required amendment, as to the means of settling compensations as well as in respect of accommodation works. It was impossible, as it appeared to him, for anybody to say accurately what compensation

should be paid for severance, without knowing exactly what accommodation works were to be provided, and they should be arranged under the charge and control of the person fixing the compensation. No doubt, it would be impossible to get these cheap railways, unless the requirements of the Board of Trade with respect to roads were relaxed. In the case of the Northern and Eastern railway, through a part of Essex, when that was first made by Mr. BIDDER, almost every road was passed on a level; from that they got to passing every road by a bridge. It would not be necessary, in the case of a very large number of country roads, that they should be crossed by bridges; and, therefore, the reduction of accommodation works was an important element in the construction of cheap railways. What Mr. LLOYD had said about the Act of Parliament relating to Ireland was new to him; but they would all agree that a public arbitrator, appointed by the Board of Trade, would be a ready and inexpensive mode of arriving at the value of property. No doubt, it was expedient that the awards should be deposited, but he thought it very inexpedient that the question should be re-opened in the Courts of Law. With regard to the purchase of land, he had seen great inconveniences arise from non-payment for land, or, rather, from the fixing of rent-charges. In many cases where rent-charges had been taken for land, and the railways came into difficulties, the parties could not get their rent. It appeared to him that a man who parted with his land should receive an equivalent for it, the same as if he sold a house, or any other property; and his experience led him to the conclusion that rent-charge was not an expedient form of payment for land. It had been said by one speaker, that these branch lines could be best made by the existing companies. No doubt, up to this time, they had been in a very unhealthy condition with re-

gard to railways. There had been a large amount of financing, which had destroyed the credit of railways, and prevented, he believed, for many years to come money being invested in them, other than by those actually interested in the land in a district not served by railways; but he thought the existing companies, after they had recovered themselves, would be the parties to construct these lines of railway. As to funds, if any difficulty existed, the remedy was to be found in Mr. DENTON's suggestion of a rate in aid, as was done in the case of turnpike roads when the income from tolls was not sufficient for the payment of interest and their maintenance. He could not conceive why, in the case of railways, which were more and more superseding the use of ordinary turnpike roads, such a system as that might not be advantageously adopted. He was sorry to hear Mr. LLOYD say that the proceedings necessary to obtain powers for Inclosure and Sewers' Acts were not applicable to railways, because he had hoped to see the way to some inexpensive means of obtaining the objects they had in view.

After a short conversation on the constitution of the proposed committee, it was resolved,—

“That it be left to the Council to consider what steps (if any) can be taken to promote the Extension of the Railway System, especially in agricultural districts; and that the Council of the Institution of Civil Engineers be asked to co-operate in any way that may be thought desirable.”

ON THE ART OF VALUING AGRICULTURAL LAND,

AND ON

THE INDICATIONS OF THE VARIOUS QUALITIES OF SOILS.

By PHILIP D. TUCKETT, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
March 22nd, 1869.*

HENRY ARTHUR HUNT, VICE-PRESIDENT, IN THE CHAIR.

THERE are probably few subjects within the whole range of the profession, which oblige the surveyor to rely so entirely upon his own judgment and knowledge, as the determination of the rental value of agricultural land.

When an estate is to be sold, it may be observed that almost every probable purchaser has his own opinion as to the number of years' purchase it is worth, whilst, for the great body of the public, the actual existing rental must necessarily be taken as the only available basis, until professional advice is obtained to test it.

Again, in valuing house property, it is often possible for those who have little previous acquaintance with a locality to form something like a fair estimate of the rental value of a house, by comparing it with other houses of which the rents can be ascertained, and similar comparisons can often be instituted in the case of building or accommodation land, or almost any description of property depending for its value mainly on position, whilst it is seldom difficult roughly to calculate the cost of any building.

Such aids to the judgment are not to be had when walking over a farm; for, as we all know, the variations in the qualities of the soil are far too sudden and uncertain in most districts, for the rental value of one estate or farm, or even field, to be deduced from that of those near it, whilst the indications of fertility or barrenness, though plain and reliable enough to those who know how to read them, are not usually apparent to the ordinary eye.

The principles on which the amount of rent should be arrived at, and the indications of rental value afforded by land, form therefore, I venture to think, one of the most interesting subjects for discussion by the Members of our Institution.

The rent of land, we are taught by RICARDO and the political economists, consists of the difference between its "nett produce" and the nett produce of the worst land which it is worth while to cultivate at all; the term "nett produce" indicating what is left after deducting the tenant's interest on his capital, and remuneration for his own labour and superintendence, as well as the actual working expenses. That is to say, that if the produce of a piece of land will barely cover such interest and tenant's profit and expenses, it is just worth cultivating, but only at a nominal rent; whilst, for a more fertile piece of land, the tenant can afford to pay the value of the whole of the increased nett produce, though in estimating this it must be borne in mind, that the more productive land will involve a larger deduction for interest on capital as well as for heavier rates and taxes, and some increase of expenses consequent on larger crops.

The late ROBERT BAKER, in his edition of *Bayldon on Rents and Tillages*, suggests that the rent is to be calculated by estimating the expenses incurred and the profits arising during the whole course of one rotation

of crops on different soils; and he very justly observes, that the land valuer must be constantly alive to the changes in the market price of the various articles of produce, and, he might now have added, to the supply of agricultural labour in the various localities. He also remarks, that the cost of cultivating various soils differs so greatly in proportion to the gross produce obtained, (especially in these days when, by high farming, the increase of the gross produce depends so greatly on the skill of the farmer and on the investment of capital,) that the notion which seems to have formerly prevailed that a fourth or fifth of the money value of the produce will represent the rent, is fallacious in the highest degree. There can be no doubt of the truth of this last remark; the calculations suggested by Mr. BAKER are, theoretically, the only sound basis for determining rent, although he has to admit that experienced valuers do not, in practice, rely entirely or even principally upon them. The truth is, that such calculations are liable to be so seriously altered by such comparatively slight variations in the estimated produce and expenses, that although many intelligent farmers could apply them to their own farm or even parish, comparatively few men are able to carry them much farther, and the possession of accurate data for their general application implies a degree of experience which renders them almost superfluous.

I think the sound plan is to go carefully into these calculations as to the best and worst qualities of both light and heavy arable and pasture land, so as to form and keep a well settled scale of values, to be filled up on going over each estate.

An actual knowledge of the rates at which the various classes of land are freely hired by good tenants, is also, I need hardly say, a most important practical test of the

accuracy of such individual calculations, and is gradually acquired by the negotiations incident to the practice of a land agent; but whatever the method by which the valuer fixes in his mind his scale of rental value, what he has to do in looking at any particular field or estate, is to obtain such indications of its quality as will enable him unhesitatingly to give it its true place in this scale.

The great majority of farmers, I believe, judge entirely, or almost entirely, by the crops, and they usually give surveyors the credit for doing the same. I have often been amused, in walking over a farm in company with the occupier, at being told incidentally, that he didn't know what sort of field such an one was, because he had only had it four or five years, and he did not know yet what sort of crops it would bear. The same notion probably has something to do, along with many other causes, with the circumstance that instructions for such a large proportion of valuations are given about the time of year when the land begins to be so covered with crops that it is increasingly difficult and laborious to examine it. If the object be to advise a tenant whether to hire a farm or not, it may be very desirable to judge from the crops what condition it is in; but it may be safely asserted, that the valuer who allows them to influence his judgment in determining the permanent rental value, is very liable to fall into serious error—over-valuing poor land which has been highly farmed, but under some new tenant will some day return to its poverty; under-valuing mismanaged land, which possesses the power of producing good crops with proper treatment. The local knowledge, which is thought so much of in some quarters, and which is founded on the reputation of different farms according to their former crops, is not an affair of judgment at all, but of traditional knowledge, and is totally different in its very

nature from the judgment of a surveyor founded on his own observation. The one is useless directly it passes out of its accustomed locality; the other is of general application. The one cramps the mind by accustoming it to trust to traditional reputation, which is only the general opinions of the casual observer; the other strengthens the judgment and prepares it for dealing with new subjects as they arise. Few things are so easily acquired with a little inquiry and trouble as such local information on any given point—few things are more difficult to obtain than a good sound independent judgment upon it.

But to return from this digression. Although it is exceedingly dangerous to attempt to judge of the quality of a soil from the crops grown upon it in one particular year only, still many most useful indications may be obtained from its more permanent products, especially from the trees and grasses. Most of our ordinary forest trees have special proclivities for the various soils on which they flourish, and a careful observation of their growth, and of the hedgerows, affords information which will seldom mislead. A really thriving elm tree or hazel cannot be found where there is not a good mixed soil, whilst an abundance of oak and blackthorn are indications of heavy land, and the growth of the trees will generally correspond with the depth and quality of the soil. The alder and the willow are only found in wet places, chiefly by the water side, and the poplar usually in wet places. On the other hand coniferous trees prefer the lighter soils, and the Scotch fir grows on thin lands which will produce nothing else except heather; and the beech, though it will grow elsewhere on good land, is usually indicative of a calcareous soil. The sycamore is partial to light or sandy soils, whilst the walnut, and I believe I may say the maple also, usually grow on good mixed loams. The ash is scarcely a sign of

any particular kind of land ; if it is of rapid growth it indicates good land ; in poor stiff clay it is constantly met with, but is of slower growth and often stunted. The white thorn, if it grows rapidly, is a sure indication of good land ; and one never sees a strongly grown quick fence on inferior soils.

The various permanent grasses which make up the swards of an old pasture, and even the weeds found in the land, and the character of the growth of both, form most valuable indications of the quality of the land.

This part of the subject is treated in great detail in a long and admirable essay by Mr. BRAVENDER, published in the Fifth Volume of the Royal Agricultural Society's Journal, to which I would refer those who desire a greater amount of botanical detail than I can afford space for in this Paper.

It is estimated that the distinct species of natural grasses, natives of this country, are in number about 150 or 160, whilst those which are recognized as covering the surface of good old pasture land, number, I believe, only about 18. It is said that a square foot of old pasture or meadow land contains about 1,100 plants, a square foot of water meadow about 1,800, and a square foot of a crop of grass seeds on arable land only about 80. The species of the best permanent grasses being so moderate in number, it is worth while to learn their names, and also to recognize them at sight when in flower.

They are as follows :—

<i>Dactylis Glomerata</i>	Cock's-foot Grass
<i>Alopecurus Pratensis</i>	Meadow Foxtail
<i>Festuca Pratensis</i>	Meadow Fescue
<i>Festuca Duriuscula</i>	Hard Fescue Grass
<i>Phleum Pratense</i>	Greater Meadow Cat's Tail Grass
<i>Anthoxanthum Odoratum</i>	{ Sweet Scented Vernal Grass
<i>Avena Pratensis</i>	{ (which gives its scent to Hay)
	Meadow Oat Grass

<i>Avena Flavesceus</i>		Yellow Oat Grass
<i>Cynosurus Cristatus</i>		Crested Dog's Tail Grass
<i>Holcus Avenaceus</i> , or	}	
<i>Arrhenatherum Avenaceum</i>		Tall Oat-like Soft Grass
<i>Hordeum Pratense</i>		Meadow Barley Grass
<i>Lolium Perenne</i>		Rye Grass
<i>Poa Annua</i>		Annual Meadow or Suffolk Grass
<i>Poa Trivialis</i>		Rough Stalked Meadow Grass
<i>Poa Pratensis</i>		Smooth Stalked Meadow Grass
<i>Trifolium Pratense Perenne</i>		Perennial Red Clover
<i>Trifolium Repens</i>		White or Dutch Clover
<i>Vicia Sepium</i>		Creeping Vetch

All really good pastures are composed chiefly or almost entirely of the above grasses; leafy plants take up so much space in proportion to their produce, that they are necessarily wasteful, even when not otherwise injurious. The proportion in which these best grasses occupy the surface is a pretty sure indication of quality.

Mr. BRAVENDER, in the Paper above mentioned, gives several lists of flowering plants and natural grasses, with their several indications; but, with a view to condensation, I shall confine myself to selecting only a few specimens and arranging them into two very important divisions—a few of the principal plants indicating cold wet land, and a few of those found on very dry soils; because, as the valuer visits the land in all sorts of weather and at different seasons, he may be principally dependent on vegetation to tell him whether a field is injured by excessive wet in its ordinary condition, or, on the other hand, whether light land is excessively dry and likely to burn, whilst of almost everything else he can always judge by other means; and because, if one attempts to extend such lists too far, the indications intended to be derived from them become less clear and simple. It is a very curious fact that the herbage of a wet grass field almost entirely changes when it is drained; this is the reason why people used to say that grass land could be easily over-drained, and was often

injured by draining. The fact is, wet grass land *is* injured by draining for two or three years, the old grasses dying off and the better ones not having yet fully taken their place.

PLANTS INDICATING COLD WET LAND.

Agrostis Palustris	Marsh Bent Grass
Aira Aquatica	Water Hair Grass
Aira Cæspitosa	Tufted Hair Grass
Alopecurus Geniculatus	Floating Fox Tail Grass
Carex	Carnation Grass
Centaurea Calcitrapa	Blue Bottle or Star Thistle
Cnicus Palustris	Marsh Plume Thistle
Hippuris Vulgaris	Mare's Tail
Potentilla Aserina	Silver Weed
Primula Veris	Cowslip
Rhinanthus Crista Galli	Yellow Rattle
Scabiosa Succisa	{ Devil's Bit Scabious, or
Tussilago Farfara	{ Blue Button
	Coltsfoot

PLANTS INDICATING VERY DRY LIGHT SOILS.

Agrostis Vulgaris	Common or Fine Bent Grass
Aira Flexuosa	Wavy Mountain Hair Grass
Aria Cristata	Crested Hair Grass
Campanula Glomerata	Canterbury Bells
Campanula Rotundifolia	Heath Bell Flower
Erica Vulgaris	Common Heath, Ling, or Heather
Festuca Ovina	Sheep's Fescue Grass
Galium Verum	Yellow Ladies' Bed Straw
Onobrychis Sativa	Wild Sainfoin
Thymus Serpyllum	Wild Thyme

In addition to the *species* of grasses, a good deal may be learned by the character of their growth. On good land the blade grows full and broad; on poor wet land it often looks stunted; whilst on thin sandy soils it is apt to be thin and wiry.

When pasture land contains a large proportion of the mosses, it is a sure sign of poverty, and more often of poverty caused by constant mowing and the want of manure than of natural barrenness.

On commons and unreclaimed land the common brake

or fern (*pteris aquilina*) generally grows on the best land, and Irish gorse, heather, &c., on the inferior portions.

The general colour of the surface of pasture land is also some guide to its quality. The colour of all pastures changes with the season, and no land is green all the year round (though the best land looks green the longest), and a fresh green colour is often dependent on recent manuring; but in winter, when the frosts have stopped the growth of the grass, poor cold grass land turns brown, whilst good sound pastures are never brown but assume a whitish hue.

I must now proceed to point to that which I had especially in my mind when I commenced preparing this Paper—the primary indications to be obtained by an examination of the soil itself, by which, I think, the same results may generally be arrived at with greater directness and certainty. By far the larger proportion of the food of plants is derived from the air, through their leaves, or from water absorbed by their roots; and of the remainder, the greater part is obtained from animal or vegetable matter, applied to the land in the form of manure (not necessarily for any particular crop, because the soil has a remarkable power of absorbing and retaining a portion of such matters); so that it happens that the food supplied to the crops by the actual natural soil itself is confined to very small quantities of certain soluble mineral matters, such as the various combinations of lime and silica. What is, therefore, chiefly required of the soil, by plants, is not a supply of food, but mechanical support, under favourable conditions, for allowing a free circulation of the air, necessary for the decomposition and assimilation of organic matters, and for retaining a constant supply of moisture even in dry weather, without, on the other hand, retaining an undue amount of water

in wet seasons, and allowing it to become stagnant, to the exclusion of the air. All soils are mainly composed of three substances—sand, clay and lime,—and every fertile soil *must* contain a proportion of each, because each in a slight degree enters into the composition of plants; but it is on the mechanical condition or consistency, resulting from the proportions in which they are combined, the depth of the surface soil, and the character of the subsoil in reference to the retention of moisture, that the fertility or barrenness of the soil primarily and mainly depends. Thus, when mixed in good proportions, with good depth, with a slight preponderance of clay, a strong fertile loam is the result, capable of producing large corn crops; or, with a slight preponderance of sand, a deep sandy loam, producing great root crops and prolific market gardens. Where one element is greatly in excess—a hungry sand or gravel, a thin barren chalk soil, or a poor thin-skinned clay is the result; where the sand is greatly deficient, and the other two elements greatly in excess, a tenacious marl; or, where the lime is wanting, the weak clay soils, characteristic of the Silurian slate formation, and some others.

In the great majority of cases, the soil is only the subsoil altered by long exposure to atmospheric influences and cultivation, and with a supply of organic matter derived from the roots of plants. Thus, light land usually has a subsoil of sand, gravel or rock, whilst a clay subsoil usually underlies a clay soil; but, when from special causes this is not the case, the effect on the fertility of the land is very striking. Thus, some of the finest old pasture lands will be found to have a strong soil of sufficient depth to retain moisture and manure, resting on a bed of gravel, which provides a perfect drainage. This is also managed artificially, to a great extent, in warping, on the Humber, by taking advantage of the fact that the sand settles much faster than the clay, and

allowing the water, when the current is checked, to flow first over a piece of land just beginning to be warped, and afterwards to reach the portion which has more nearly attained its intended level.

Although the mechanical condition is thus the chief cause of fertility or barrenness, there are in some cases other substances which have a direct influence on vegetation. The chief of them is phosphate of lime, which enters so largely into the composition of bones, but also exists in certain fossiliferous strata, and adds considerably to their fertility. On the other hand, certain salts of iron and other substances occasionally occur, which have a deleterious influence; and the fertility of alluvial land, deposited at the mouths of rivers, may, in great measure, be due to the amount of organic matter brought down along with the soil by the stream; especially if we recollect that a century or two ago the use of manure can hardly be said to have been known in many parts of this country, and the refuse from stables and cow-houses was not unfrequently thrown into a neighbouring stream.

But whatever other circumstances may have to be noted, the mechanical conditions of the soil remain by far the most material; and these are precisely the ones which can be most certainly arrived at by an examination of the soil itself. There is no difficulty with a good walking stick in ascertaining the depth, nor in judging of the texture; and by examining the ditches and the sides of sand, gravel, clay or chalk pits, the nature of the subsoil can often be learned, even without using a spade; and if his conclusions are based on a real examination of the land itself, the valuer is not liable to be misled by the results on vegetation of peculiar seasons, or the particular time of year when he sees the land. And when he has the opportunity of *fairly* testing his results by the crops, he will not find that he has been misled.

There is one science which is often spoken of as having

an important bearing on the profession of a surveyor, but I have never seen any practical suggestion of how it can be rendered really available in the valuation of land; and that is, the science of geology. I am, however, myself, fully convinced that although a very complete knowledge of the science in all its details is not needful for the purpose, a knowledge of its general laws—the distribution of the strata, their order, thickness, general direction and dip, and a sufficient acquaintance with each to recognize it in passing across the country—is exceedingly useful in land valuing, provided the surveyor knows how practically to apply it. Mr. BRAVENDER, in the Paper before referred to, has taken great pains in preparing a careful and interesting enumeration of the soils found on each formation, and states whether they are barren or fertile; but as the practical result is that almost all the formations contain both barren and fertile soils, I fear that all the information we derive from that mode of treating the subject, if we consult a geological map before setting out on a valuation, is only a general idea of the sorts of land we are likely to find; but no real assistance in actually valuing it. It must be borne in mind that geological classification is chiefly paleontological and not mineralogical; and, even if it were, the various beds do not always come to the surface, but are overlain by all sorts of surface deposits, from small accumulations of soil in hollows to vast deposits of overlying drift. And the surface soils are often so mixed and varied, that most of the formations have both fertile and barren soils, according to the various mechanical conditions resulting from the accident of their particular position. I have been led to think, in the course of my observations of the soils on the various strata, that this subject is susceptible of an entirely different treatment; and the use to which I propose to apply geology in land valuing is to correct and modify the results of a direct examination of the soil, according to certain known charac-

teristics of the various formations. Thus, to begin with the clays and heavy soils, which are the most easily compared. These consist principally of alluvial clays, the London and Plastic clays of the Tertiary system, the Weald, Kimmeridge, Oxford and Lias clays, and the new red marl of the secondary system; the clays of the coal measures, and those weak clay soils devoid of lime, found amongst the Silurian and Cambrian systems, besides the purer clay formed by the decomposition of granite. Now clay soils, on each of these formations, comprise a considerable range of difference, as respects consistency or texture, and depth; and it is not difficult to find specimens of soils in different formations, which, in these respects, and even in colour, and in everything that can be judged of by touch or sight, are as nearly as possible alike. What I have observed and am disposed to allow for in making valuations, is, that under these circumstances, there are certain formations, the soils on which will be of better quality, and others where they will be worse than they appear. The alluvial clays are, no doubt, the most fertile, even when judged by this standard, as one may well be led to suppose likely, considering the large proportion of organic matter which they generally contain. Next to them I should place the Lias clay. This formation comprises some very stiff, poor, thin-skinned land, as well as much that is better, and some of the best Leicestershire pastures; but when it is bad it always looks so, and is, I believe, always more fertile in proportion to its texture and depth than some to be afterwards mentioned. It will be recollected, that this formation is associated with the Lias limestone containing all the great saurian fossils, and a very small percentage of phosphate of lime, in addition to an ample supply of the carbonate, may possibly account for what I have observed. The London clay also, though not in so great

a degree, may be said to incline to fertility; and it will be noticed that this also rests upon a carbonate of lime in the form of chalk, though it does not possess the same supply of fossils. The Oxford clay, on the contrary, which bears the same relation to the middle oolitic series that the Lias does to the lower one, is certainly of a barren nature in comparison to either it or the London clay; *i. e.*, a soil on the Oxford clay will be found slightly less productive than one of the same consistency and depth on either the Lias or London clay. I can offer no satisfactory explanation of this fact, but I feel sure it is a fact. Still more are the clay soils of the Weald of Sussex and Kent of an infertile nature; although they contain small deposits of shelly limestone, called Petworth or Sussex marble, this deposit is, probably, generally deficient in lime, whilst it is often associated with ironstone; but whatever the cause, I know that stiff and poor as it often looks, the Weald clay is even less fertile than its texture would indicate; and that a valuer, accustomed to other formations, will do well to make his calculations with great caution on entering the Weald. Of the other soils mentioned, the red marls are among the most fertile; the plastic and Kimmeridge clays do not occupy large areas, but most nearly resemble the London and Oxford clays respectively; the clays of the coal measures are often very poor, and those on the slate rocks especially so.

The lighter soils are not so easily compared, because they do not so closely resemble each other in appearance and texture. The similarity between two different clays is much closer than, for instance, that between a light soil resting on the chalk containing flints, and made up chiefly of sand, gravel, and chalk; and one resting on the oolitic rock, containing small pieces of brown limestone, which, though a light thin soil, is in reality composed of particles of clay mixed with limestone, with only a small

proportion of sand. Still, I think, some comparison may be made; and, I believe, it will be found that the same fertility observed in the Lias clay is preserved throughout the whole of lower oolitic series, even to the great or Bath oolite; although Mr. BRAVENDER, whose residence is near the worst part of it, instances this as a noted specimen of barren land. But, although its average rental value along the Cotteswold Hills is low (probably considerably below £1 per acre), if its extremely shallow soil, lying on a hard rock for subsoil, on the tops of those hills, be considered, I think it is evidence of the wonderful property of this rubbly rock for retaining moisture, that the crops are not burnt up, as they certainly would be with a gravel or sandy subsoil, with only a similar depth of soil, which on the chalk would form hardly more than down land, and on slate rocks be almost worthless. And on other parts of its range, on Lincoln Heath, not to say in Oxfordshire and Nottinghamshire, its rental value rises to very respectable figures.

The narrow belt of inferior oolite sand between the Bath oolite and the Lias, which runs through England from Guisborough in Yorkshire, to near Crewkerne, Sherborne and Yeovil in the south-west, is everywhere singularly fertile, and forms some of the best light deep arable land in the kingdom. This formation again is singularly full of fossils, and like the adjoining Lias, I suspect that it contains a trace of phosphate of lime. The sandstone of this formation contains the celebrated Cleveland iron, and I believe it is, in great measure, due to its containing a certain portion of lime, that the iron can be made from it so economically, although it is not enough to supersede the use of other limestone as a flux. The green sand also, associated with the lower chalk, is essentially fertile, whilst the Hastings sand and ironstone of the Weald of Sussex are essentially barren.

I am not at present able to carry these comparisons out with certainty through the remaining varieties of light land, and, therefore, must be content to leave these notes somewhat imperfect on that point. This mode of comparing the different strata is one that has occurred to me, and which I have never heard suggested by any one else, and, possibly, it may be considered as fanciful; but I am rather desirous of calling especial attention to this part of my Paper, because I should be much interested in hearing what others think of it.

In addition to those enumerated, many other signs of good or bad land are often pointed out, but I believe most of them naturally result from what has been already stated. Thus the size and colour of the stones in light stony soils is often much thought of, and there is no doubt that in the chalk, small water-worn gravel stones indicate a thin gravel immediately below the surface, whilst larger flat flints, though they make the ground look more stony, and cover a much greater surface, are split off by the plough from a more solid layer of flint below, which may have a very useful soil over it. Again, the colour of soils is often spoken of, but it varies so exceedingly in both good and bad land, that all I am inclined to say about it is, that the darker coloured soils usually contain the largest proportion of "humus" or vegetable matter, which is generally an advantage, but like all things else, may be in excess, as in peat soils.

To sum up, then, my ideas about the indications of the intrinsic value of a soil, I think the valuer should form his conclusions primarily from an examination of the soil itself, as to its mechanical composition, depth and subsoil; then he should modify those conclusions by his knowledge of the geology of the district, and check and confirm them by all the botanical evidence his observation may collect. By carefully carrying out this method, I believe he secures himself from being misled, either by high or low farming,

dry or wet summers or winters, different seasons of the year, or any other causes, which are apt to affect the appearance of the surface, and sadly deceive those who look at what is upon the land, rather than at the land itself.

Having determined the intrinsic value of the soil, there are many other things to be considered before arriving at the rental value of a farm. One of the most important is the situation of the lands with reference to the homestead, a compact farm with a homestead in the centre being much more economical to work than one where the lands are scattered. But if the valuation be for the purpose of sale and not for letting, it will be well to recollect that what is inconvenient for one occupier may have a special value for another, and that a simple re-letting may bring each enclosure to its full value. The sizes of the enclosures and the quantity of land lost in wide fences may also be noted; but small fields generally imply small tenants who pay high rents, so that, practically, the great loss of space and labour resulting from too numerous hedges does not usually fall on the landlord. The particular position of a farm with reference to markets and railway stations, and its having a ready access by good roads, are very important points; but since, with our present railway system and easy communication, the values of the principal agricultural products are pretty nearly equalized over large areas, the rental value of the same quality of purely agricultural land, devoid of any accommodative character through proximity to towns or otherwise, will not be found very greatly to vary throughout the country, except in those districts where a marked alteration in climate materially affects the character or quality of the produce.

There are favourite counties where the number of years' purchase obtained for an estate is increased by competition, but I do not think the rents that farmers give vary to the same extent for similar land.

The elevation above the sea level and the climate make a great difference if the valuer's observations are extended over a sufficiently wide area. In the south eastern and midland counties the variations are not important. All along the west coast the dampness of the climate materially affects the course of husbandry, and gives a great preponderance to grass land.

The aspect should be noted. It is of course desirable that land should slope to the south rather than to the north, so as to receive the sun's rays at a larger angle, but it must be remembered that any steep slope is objectionable, in whatever direction it may be.

Of the drainage of retentive soils I say nothing here, because, in the examination of the land itself, it will of course be ascertained whether it is dry (naturally or artificially) or whether it remains wet, but any liability to flood should be carefully allowed for. The character of the farm buildings, the presence or absence of hedge-row timber, adjoining woods, game and rabbits, are also modifying circumstances of importance, enough to occupy more than one Paper for themselves, and I merely allude to them to show that the subject is not complete without them. The whole subject is one that must be very interesting to many of us; but it depends so entirely on personal experience and judgment, that it is very difficult to convey much information upon it in a written form. Still, I believe, that every attempt to reduce one's ideas to a systematic shape must be useful, if only that it tends to help us the better to arrange our observations, so that more of their results are permanently preserved in the mental storehouse for future use. I trust that these notes may be the means of eliciting the experience and observations of other Members, and may, at any rate, have the merit of originating a useful discussion.

Mr. EDWARD RYDE (Member), rose to propose a vote of thanks to Mr. TUCKETT. He thought there were other indications of value besides those alluded to, which might have occupied a more prominent position in the Paper, such as the proximity of a railway station, and the advantage of good public roads. He knew a farm which was only one field wide on each side of a turnpike road, with gates therefrom into every field; and it was considered that this peculiar position added half-a-crown an acre to its value. The position of the market town with reference to the farm was another great consideration. Again, the aspect of a farm was a very great element of value; also the size of the fields and the straightness of the hedges. Small crooked enclosures were much more expensive to cultivate than long straight fields. There could be no doubt that the dearest land a man could farm was that which usually commanded the lowest rent. Land at Faversham, or in the Isle of Thanet, which was worth 60s. per acre, was cheaper than that in the New Forest, for instance, at 10s. The one would make a man's fortune, and the other would be likely to ruin him. The expense of cultivation of poor land was generally as great as the cultivation of good, and it often required more ploughing. It was true, no doubt, that some of the expenses followed the amount of the produce; but wheat was cut by the acre, though hops were picked by the bushel. Then again, they must be careful not to confuse the indications of fertility with those of good farming. If they passed through the land of a farmer who kept his hedges neat and his land clean, that would look worth more rent, and so it was; but it did not follow that the land of the slovenly farmer alongside was not equally good in fertility.

Mr. H. CRAWTER (Member), in seconding the vote of thanks, said the author of the Paper had introduced a

subject of great moment, viz., that of grasses, to which he thought sufficient attention had not hitherto been paid ; it was an inexpensive cultivation, and gave a very profitable return. It was true, as Mr. RYDE said, that poor land was dear at any rent ; in the Weald of Sussex the tithe of the arable land was sometimes nearly as much as the rent, and the expenses of farming very great.

Mr. G. WESTBURY (Member) wished to express his acknowledgments to Mr. TUCKETT for having introduced a subject to the Institution at once so useful and instructive. It was one which needed discussion, and their time could not well be more profitably employed than in attempting to reduce to something like general principles those indications which guide the surveyor in his judgment on the true character and value of land.

Mr. E. SAUNDERS (Member) observed that Mr. TUCKETT had called attention to the fertility of soil as indicated by the grasses which grew upon it. Now they all knew that grass land could, with little expense and in a short period, be changed wholly in its character. He remembered an instance in which some grass land, on a cold clay soil, had been valued at 40s. per acre, while the land on an adjoining farm of equally good quality was put at 18s. an acre. The explanation was that the land in the first case had been in the hands of a chemical farmer, who had applied a considerable dressing of gypsum to the land, by which the growth of good clovers had been promoted. They must not, however, be always governed by the simple indications afforded by grasses. They ought rather to ascertain how the land had been farmed ; because clean farming, frequent ploughing, and artificial dressing would produce those indications of value which were not otherwise natural to the soil.

Mr. P. BADCOCK (Associate) wished to make one or two observations with regard to the geological aspect of the question, to which particular attention had been called. He thought Mr. TUCKETT had gone a little out of his way to compare soils which had not the same geological conditions; for instance, to compare the Weald, which had little lime in its composition and was essentially poor, with the lias, which contained the elements of fertility within itself, was of little practical use. Again, from the comparison made between the two oolite clays—the Kimmeridge and Oxford—noticed as resting upon a calcareous base, with the London clay resting on the chalk, it might be inferred that the London clay bears the same relation to the chalk as the Kimmeridge and Oxford clays do to the oolites. But that was not the fact. The London clay is a tertiary deposit resting on the chalk which is one of the secondaries, but is in no way mixed with it or associated with it in any degree. The same remark also applied to the plastic clay which covers a large area of the chalk hills. There is little or no lime in the plastic clay, and in fact it had been for generations, and was still, chalked to a large extent, in order to improve its fertility. It must also be borne in mind that it is the exception to find any of these clays in their normal condition. Two-thirds of the whole area of this country is covered with drift and diluvial deposits of every kind; sand, gravel, and clay are mixed up in endless variety, and it would generally be found that all these clays are fertile in proportion as they are mixed with these surface deposits. Mr. TUCKETT had, he thought, exercised a wise discretion in not pursuing his comparison very much in detail in the case of the lighter soils, because, as he truly said, there was much more difficulty in doing so satisfactorily; some of the light soils were essentially fertile, while others were essentially barren, and a comparison of them would be of little practical importance.

He thought there was one point which was worthy of the attention of the Institution. No doubt the geological survey of England had been of great service in forming the basis of the operations of the valuer; but maps were wanted showing the surface soils, the direction and nature of the drifts, diluvial deposits, and information of this kind. This would be of great value commercially and agriculturally. It would show the soils most suited for manufactures of various kinds, it would also promote the establishment of a nomenclature for the dissemination of agricultural information upon a common basis, and would be useful for drainage and other purposes.

Mr. W. REX (Associate) thought sufficient consideration had not been given to the circumstances of climate. In the south of England, and in Surrey, there were large quantities of light land, which if they could be cultivated with turnips would be good and productive, but which were chiefly barren on account of the dryness of the soil. There was similar land in the north of England where turnip cultivation was carried on to a great extent, and crops were produced capable of feeding 160 to 200 sheep per week per acre, followed by heavy crops of corn, particularly oats, with abundance of straw. The difference in this respect was attributable to the greater amount of rainfall in the northern climate. Thus a light soil in a moist climate was made to produce crops equal to much better soil in a dryer climate, and this of course greatly affected the rental value. Mr. TUCKETT had addressed himself chiefly to the productiveness of soils, independently of cultivation. Now, the effect of good farming might be seen in land adjoining a common, worth perhaps 30s. or 40s. per acre, whilst the Common just over the hedge might not be worth, for five or ten years after it was broken up,

anything like half that rent, and this difference might be attributed almost wholly to the good cultivation which the enclosed land had received for so many years. It was therefore a matter of the greatest importance in valuations to consider in what way the land had been farmed. Again, if the homestead were good and pleasantly situated, with good access to the land, a tenant with sufficient capital would be attracted, and that farm would be worth several shillings per acre more than a farm in an outlandish place, difficult of access, and which only a poor tenant with insufficient capital would be induced to take.

Mr. R. VIGERS (Member), being strictly a London man, could offer no remarks upon agricultural matters, but with respect to the presence of wild thyme in pasture land being taken as an indication of a dry soil, he could only say that he once passed over a very wet lawn, on which there was an abundance of that plant.

Mr. P. BADCOCK mentioned that the *Potentilla Anserina*, or silver weed, was given as an indication of wet and cold land ; but it certainly grew most abundantly in Oxfordshire on a limestone formation, and often in the driest places by roadsides. Coltsfoot also grew on limestone rubbish and other dry places. He added that the cowslip was not restricted to wet and cold lands. No doubt water grasses were an indication of wet land, but in a great measure they disappeared when the lands were drained.

Mr. JOHN S. ELLIS (Associate) thought, in estimating rental value, the means of procuring the necessary labour for carrying on the farm was an important consideration. In places near large towns or barracks, in summer and harvest time, when extra labor was required, it generally could be

obtained at lower rates, and in any quantity; in other instances farmers were almost bound to give whatever was demanded.

Mr. TUCKETT (in reply) said, the principal object of the Paper was to call attention to the best method, according to his notion, of arriving at an estimate of the intrinsic value of the soil itself. He had lightly touched on the various other matters which the valuer has to consider, and he was happy to find that no point referred to in the subsequent discussion had escaped some notice in his Paper, although much that was valuable had been added to what he had written; but the whole subject was far too wide to be enlarged upon in all its details in a single evening. Mr. SAUNDERS and Mr. REX had both spoken of the great difference in value between adjoining lands, where the soil had been improved and where it had not. Now one great object in making valuations for permanent purposes, was to distinguish between permanent improvements and the temporary effects of high farming. The effects of high farming, deep ploughing, &c., pursued for a long period, ended by becoming, permanent; and his own notion was that if the actual texture and depth of the soil was examined, rather than the crops, these improvements would be taken into account, about as far as they had become permanent, by actually altering the character of the land. In the case alluded to, of two adjoining grass fields—one worth 40s. and one 18s. per acre—a comparison of the soil with the grasses on the worst land would show that it was capable of better things, and although 18s. might be the right figure for rental, he suspected that, if valued for sale, it ought to be put rather higher from its latent capacity for improvement. He might further remark, that whenever the grass land on a farm appeared from its herbage to be of less value than the ad-

joining arable fields, it was a pretty sure sign that the pastures had been neglected, and were capable of great improvement. He was much interested in what had fallen from Mr. BADCOCK with regard to the clays in different geological formations. No doubt all these clays were greatly modified by mixture with surface deposits of various kinds; but it must be borne in mind that these mechanical modifications of texture were just what could readily be noted in examining the soil. But Mr. BADCOCK did not deny that there were also differences in intrinsic fertility not apparent to the eye or hand; and where one formation, like the lias, possessed within itself elements of fertility wanting in another—the Weald—and yet not apparent to the eye, he must say that he had found great practical utility in recollecting this fact. He had not intended to imply that the relation between the London clay and the chalk was precisely analogous to that between the oolitic clays and limestones; he had merely remarked on the fact that the London clay generally had the chalk very near it, or at a short distance below it, whilst certain other clays he had named had no deposits containing lime anywhere near them. As to the suggestion that had been made about maps showing the diluvial, drift, and other surface deposits, he had often wished that these could have been noticed in the Geological Survey, but unfortunately the geological maps ignored them altogether. He was afraid the Government was not likely to undertake a fresh survey for their benefit, and he feared it was hopeless to think of any amateur engaging in so great an undertaking. As to what Mr. REX had said about climate, when he spoke of similar light land in Surrey and in the north, it should be borne in mind that no part of the north of England rested on the same geological formations as Surrey, and he suspected the similarity in the land referred to must be understood only in a very general

sense. And he would only remark that there were such things as wet summers as well as dry ones, and the dry climate would grow much the best sample of corn, so that there were things to be thought of in both directions.

With regard to the plants mentioned as indications of wet or dry land, he must say, that though the cowslip was not confined to absolutely wet land, he could not recollect a single instance of its growth except on what would be called a cold clay soil; the coltsfoot was such a troublesome and free-growing weed, that where from accident or otherwise it once got hold of the ground, it would no doubt grow in good dry land, but there could be no doubt that the soils most infested by it were cold wet clays, and that where it was found running over a field, it was indicative of such soil. As to the silver weed, he would not speak quite so confidently. The plant, as he knew it, certainly grew in wet places, but there was a somewhat similar leaf which generally indicated very dry situations, and which he had intended to put in his list; but having written the Paper in the winter, he had no opportunity of ascertaining the name of the latter, but had made a note to do so next summer; and he was not sure that it might not turn out to be a smaller variety of the same plant. As to the wild thyme, he understood that the lawn referred to by Mr. VIGERS was close to the river, and apt to be flooded in wet seasons. He suspected that, though sometimes wet, it had a light sub-soil, and would be found very dry in hot summers. It was interesting to observe these plants and their various indications, but after all it must be recollected that it was only at certain seasons that they could be studied, and his main object had been to point more to the soil itself than to anything growing upon it.

The CHAIRMAN expressed his great regret at the absence

of the President on this occasion, as the meeting would have gained from him a large amount of practical information on the subject before them. He (the Chairman) could tell them very little about soils or the London clay, except in the form of bricks; but geology and botany were, as it seemed to him, the foundation of this great and important art, and he would strongly impress on the younger Members the study of these sciences. It was evident there may be good farming on bad soils, but good farming was no indication of value, because it was no indication of fertility. The surveyor must, in fixing the value of land, be acquainted with its geological condition or structure, and have a considerable knowledge of botany to be able to judge of these grasses, of which they had heard so much. There were, of course, other conditions which a good valuer should understand, as to whether the land was properly cultivated by a scientific farmer having money at his command, who would lay it out with judgment. The points mentioned by Mr. RYDE were, no doubt, of great importance in fixing the rental value of a farm. He (the Chairman) happened to be engaged in the west of England, under acts which enabled the Government to take land for fortifications, and it was represented to be a serious thing to take away the hedges on an estate; but he found the farmers themselves clearing their land of hedges and ditches which interfered with the cultivation, and that which the Government had to pay a large sum for being permitted to do was done by the farmers themselves at their own expense. Mr. TUCKERT had not touched upon the number of years' purchase, which was another element in the consideration of the value of land; because, from his own experience and the evidence he had heard on that subject, the number of years' purchase in different counties varied. He had given, in some cases, as much as 34 years' purchase in Gloucestershire, where the

land was letting at £3 15s. per acre. On the other hand, in Essex he had given only 26 years' purchase. There were so many conditions and circumstances attending the art of valuing agricultural land that he felt they were much indebted to Mr. TUCKETT for having brought the subject before them, and he (the Chairman) for one was personally much obliged to him for having done so.

The vote of thanks was unanimously passed and the meeting adjourned

A REVIEW OF THE PROGRESS MADE IN PROVIDING IMPROVED DWELLINGS FOR THE INDUSTRIAL CLASSES

BY THOMAS CHATFEILD CLARKE, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
April 5th, 1869.*

THE PRESIDENT IN THE CHAIR.

AT the formation of the Institution of Surveyors, the question was asked, whether in its range was to be included all those matters connected with building not mainly artistic, and the answer being in the affirmative, no apology need be presented for the introduction of a subject so deeply interesting, professionally, morally, and socially.

So much, however, has been said and written in connection with this subject, that it would be difficult to lay down any new principles which should guide its development; but it may not be uninteresting to give a “*résumé*” of the work actually done up to the present time in the metropolis, and to strengthen the hands of those whose care it has been to act on sound principles.

Before commencing the sketch I propose to give of the various societies in operation, I will in brief give my view of the first principles which should guide undertakings of this kind.

1st. That there should be economy in the outlay consis-

tently with due regard to durability and health, combined with great simplicity in all details.

2nd. That financially any scheme should be based upon such a fair percentage, in proportion to the outlay, as might be reasonably considered an inducement to others to follow the example set.

3rd. That the classes for whom you are to provide dwellings should be suited as to locality and means in the different districts of the metropolis.

4th. That freedom from restraint or interference with the privacy and self-respect of the occupants should be carefully studied.

To the professional man many other questions must suggest themselves, of great interest and importance, such as the nature and plan of the structures to be inhabited; the desirability or not of erecting very high blocks of buildings; the possibility of adapting present structures, with sanatory and other appliances, when substantially built, thereby saving much outlay; the desirability of restricting or not the amount of accommodation below that usually considered essential; and the question of all others the most difficult, viz., whether it will ever be possible to succeed in building dwellings which can be made fairly remunerative and yet applicable to the humblest classes of our citizens. Before passing on, I should like to offer a few remarks on each of these points, and to suggest a few thoughts in relation to them.

With respect to the nature and plan of the structures, it cannot be doubted that experience has proved the undesirability of erecting buildings on a large scale for single men, or for purposes of laundries and the like, with any hope of their being fairly remunerative, and that the buildings should be confined to such as are either of the block or cottage character. In like manner, it cannot be doubted, I think,

that in the plans of the various buildings an avoidance of tortuous staircases and passages, of rooms with many angles, and many doors, and too much glass, is very requisite ; also that the staircases should have direct access to the outer air ; that the passages should not have room doors opening opposite to one another ; as few passages, indeed, as possible ; that all the appliances should be iron and stone, of the simplest but yet most effective character—as also the flushing of closets, sinks, and the like ; and that, though the finish should be of the plainest kind, those additions which tend to make the dwelling comfortable in the eyes of its occupants should not be wholly wanting ; and for this purpose cheap papers, of a glazed character, that would stand washing, would be of great service (with simple polished or varnished woodwork), the coating of the walls being as non-absorbent as possible—of course, not being unmindful of the necessity for simple methods of ventilation.

With respect to the erection of very high blocks of buildings, I am doubtful whether, on a large scale, they are desirable ; for it is evident that, unless placed in a street or square of very great width, the lower floors must be in a *well*, besides the possibility of great loss of life in an alarm of fire should the staircase not be readily accessible, or not proving wholly impervious to the effects of fire in the lower stories. Doubtless the motive urging the erection of very high blocks of buildings is apparent, that you thereby reduce the ground rent proportionately over the buildings ; but in doing so you add somewhat to the thickness of your walls, and give to your buildings a character which to many forms an objection.

Taking the next point, viz., the possibility of adapting present structures for the purposes of dwellings for the industrial classes, I have always been desirous that this mode should be tried on an extended scale, for wherever tried on a small scale, with a proper choice of property, it has proved remunerative.

It has this advantage, that house property is taken on long repairing leases, often out of the hands of middle men who oppress the poor, and at no large outlay of capital a large amount of good may be done by adapting the same, and no very great liabilities incurred.

As to the remaining point, viz., the advisability of restricting the amount of accommodation with the view of keeping the rent within the means of *the humblest class*, I am not sanguine, with the present cost of land and buildings, that this can ever be done, and I fear those interested in this movement must be content to provide for a class somewhat above the lowest, hoping thereby to improve ultimately the nature and amount of the accommodation for the humblest.

After the brief notice I have given of the principles that should guide, in my judgment, the operations of such associations, I now proceed to give a summary of the results of the working of the various agencies in the metropolis for this object that I have been able to gain information upon, giving approximately the capital expended, the nett dividend divisible, the number of persons accommodated, and statistics as regards the health of the inmates as far as I can ascertain the same. I also give some particulars of the rents obtained for single and sets of rooms.

One point in connection with these results I would strongly press on the consideration of those interested in this question, viz., the recent great increase in the taxation of these buildings, and the heavy incubus it is on the poor, or in reduction of dividends on these undertakings. Sir S. WATERLOW has recently made a statement relative to the company in which he has taken so leading and earnest a part, by which it appears that by the recent change in the law an increase of $37\frac{3}{4}$ per cent. has been chargeable in respect of the rates on the company's property.

In the order I have proposed to myself, I desire first to

refer to the work of the Metropolitan Association for Improving the Dwellings of the Industrious Classes, as being the association that, on a charter involving much preliminary expense and with many restrictions, has proceeded in such a careful manner with various tentative experiments as to entitle the managers of the association to much praise.

It is satisfactory to learn, from the clear and detailed accounts presented by this association, that several of their larger buildings are earning, after the payment of every expense, more than 5 per cent., and in one of their largest blocks, 6 per cent.

The statement of general results is as follows, to Midsummer 1868 :—

Paying on a capital of about £100,000, exclusive of loans and advances and provincial branches, this association was enabled to divide at the rate of 4 per cent. last Midsummer, having earned nearly 5 per cent., accommodating a population of 3,342 persons at that date, and with the favourable rate of mortality of 14 per 1,000, the average rentals per room being, I estimate, from 2s. to 2s. 5d. per week.

Ranking next in interest, perhaps, is the Improved Industrial Dwellings Company, from the spirited way in which, in a short space of time, so many blocks of buildings have been raised in various parts of the metropolis on plans peculiar in their conception and original in the class of material used in their construction.

This company are going to avail themselves largely of the power to borrow from the Government at 4 per cent., to assist their undertaking, though the advantages likely to accrue from so doing have been lessened considerably by the great expense hitherto incurred in obtaining such loans.

With a productive capital, by the last report, of about £90,000, this company is enabled to pay 5 per cent., accom-

modating a population now of about 2,900 persons, but shortly hoping to increase that number, by their buildings projected, to 3,890 persons. No statistics of the health of the inmates have been kept, but from some partial observations in one locality, they have been very favourable. The average rentals derivable are from 2s. 3d. to 2s. 6d. nearly per week per room.

The munificent and repeated gifts of Mr. PEABODY next claim some notice—indeed, such an amount as the total of £350,000 put in trust for this object must impress every one as an unexampled instance of a generous and high-minded man seeking in what way his great wealth can be devoted for the permanent good of the community of which he is not even a countryman.

In reviewing the action of the trustees hitherto, it is difficult to go into much detail as to the results, inasmuch as the accounts presented annually to the public are very meagre in character, no revenue account being published, and no analysis being given of the interests obtained on distinct blocks of building. It is much to be wished that the trustees would consider the advisability of furnishing more detailed accounts, as great interest is felt in the matter, and it might serve by explanations to remove from the public mind false impressions, possibly otherwise arrived at.

As to the scale and substantial character of the buildings there cannot be a question, with their large and airy secluded play grounds, laundries, and other conveniences, that must add very much to the comfort and convenience of the dwellers therein; but, judging by the recent letter of the secretary to the trust, it is a source of regret that it has been hitherto impossible to realize a larger rate of interest than $2\frac{1}{2}$ per cent., “a sum,” as he justly says, “much too small to induce those actuated even partially by a view to investment, to follow the same example.”

The capital hitherto expended has been about £150,000, with a total population of 1,971 persons, the rents demanded being at the rate of 2s. 6*d.* for one room, 4s. for two rooms, and 5s. for three rooms ; the health statistics show a mortality of about 15 to 16 per 1,000.

The average wages of the working men in these buildings are stated to be about 21s. per week, and to be as carefully selected as possible to avoid a class who could pay higher rents.

The buildings erected by the Corporation of London in Farringdon Road next claim notice as a large and spirited undertaking, which sets a good example to like corporations.

These buildings are on the model (with some modifications) of those erected by the Improved Industrial Dwellings Company, with the addition of shops on the ground floor.

The outlay on this property has been about £54,000, showing on the average of three years a clear nett receipt of rather over 4 per cent., beyond which there is a portion of the site not yet utilized.

The population in these buildings amounts to 872 persons in 168 tenements, and the average number of deaths is at the rate of 22 per 1,000, showing only a difference of 1 per 1,000 over the whole of the metropolis, but as compared with a small property not far off it shows a very favourable result, where the death rate is 31 per thousand.

The Society for Improving the Condition of the Labouring Classes claims to rank with the Metropolitan Association as setting up models for imitation, and as having led this movement. This society, at the present moment, is not extending its operations, and does not consider itself committed to any continued series of erections. Its properties are various in character, several being occupied by single men and women, and it has also a public washhouse, which occasions the society considerable expense and loss ;

it has also adapted existing houses, with every needful comfort, which yield, the report states, a fair average balance.

It is almost to be regretted, I think, that the mode of conducting the operations of this society does not seem to provide a clear balance to accumulate for the extension of their operations, or a sinking fund to redeem the leaseholds, as is the case with other societies, and the expenses seem large; but this society is working with a large amount of borrowed capital, obtained as to a considerable proportion at 5 per cent.; several of the blocks of buildings show in the accounts a considerable surplus of from 4 to 5 per cent., after deducting the charges upon the same.

The capital account, not including a freehold property at Hull, shows an expenditure of about £37,000, an entire population of from 1,600 to 1,700 persons, and a death rate of 15·5 per thousand.

Miss COURTS, whose name is so universally respected for her long and generous interest in the welfare of the poor in the metropolis, has also aided this movement by the erection, in Columbia Square, Shoreditch, of a large pile of buildings, giving every facility for healthy living, and on a scale superior to others as to external decoration.

The outlay upon this undertaking has been in land and building about £45,000, the gross rents amount to about £1,840 per annum, and the deductions upon the same to about $\frac{1}{3}$ rd, yielding therefore, according to Mr. DARBISHIRE'S report, about $2\frac{1}{2}$ per cent. per annum.

There are 189 tenements, let, I am informed, at very moderate rents, which Miss COURTS will not permit to be raised, and commencing at 2s. per week. The number of inhabitants is about 716. These buildings have the advantage of laundries, drying-rooms, baths, and other conveniences, and are much valued in the poor neighbourhood in which they are placed.

Mr. GIBBS has also erected a large pile of buildings, on the scale of those erected for the trustees of the Peabody Fund, in Rochester Row, Westminster, and it is a gratifying fact, that after a large outlay in buying up the leases of old properties, so good a result comparatively should be derived; but here, also, taxation presses heavily on the success of the scheme in a financial point of view, the taxes, rates, gas, superintendence and repairs amounting to about $\frac{6}{18}$ of the gross rental derivable.

These buildings consist of 166 tenements, housing about 650 persons, at rents varying from 2s. 3d. for a single room to 5s. for a 3-roomed tenement. The total outlay has been about £32,000, and a nett dividend derived of something over 3 per cent.; the death rate averaging for two years 19 in 1,000.

Sir SYDNEY WATERLOW, with great boldness, before initiating the company with which his name is connected, experimented in this matter in the erection of a block of buildings called "Langbourn Buildings," at a cost of nearly £8,000, containing 78 tenements, with about 390 inmates, and these (partly on account of the less cost of building when they were erected) yield, after deducting all expenses, and providing for repairs, a nett result of over 9 per cent.; and these figures are obtained after a trial of five years.

The Right Honourable RUSSELL GURNEY, M.P., has also made a most interesting experiment in his own neighbourhood, which has a special value that not only does it locate the poor near to their work, but combines the element of retaining poor families in the neighbourhood adjacent to their richer brethren, in whom they may justly take a special interest.

The outlay was £2,500, giving accommodation for 10 sets of dwellings, and from 50 to 60 persons; the rentals being 7s. 6d. for three rooms with conveniences attached, and yielding a full 5 per cent. on the outlay.

These buildings are constructed on the same design, and with similiar material to those carried out by the Improved Industrial Dwellings Company.

Before closing this Paper there are other associations for this object in the metropolis which it is right to refer to, among others, the Marylebone Association for Improving the Dwellings of the Industrial Classes, and the Highgate Dwellings Improvement Company. With respect to the former, I am not able to present many particulars, but with a capital of about £27,000, spread over six properties, doubtless a considerable work is being effected. The dividend on the ordinary shares last declared was at the rate of 4 per cent., and $4\frac{1}{2}$ per cent. on the preferential stock of the company.

With respect to the Highgate Dwellings Improvement Company, built also on similar plans to the Improved Industrial Dwellings Company, it provides on a total capital of about £6,000, though the expenditure of the same is not fully defined, for 96 rooms, and the company have been enabled to pay a dividend of 5 per cent. on rentals varying from 2s. to 2s. 3d. per room per week, and for two and three rooms in a somewhat less proportion.

In giving this sketch, I ought not to omit some other societies and persons who have worked out schemes of the kind, and amongst others the Strand Buildings Company, the Central London Dwellings Improvement Company, the London Labourers' Dwelling Society, the Rev. Mr. BURGESS, Mr. G. BARKER, Mr. J. H. HARLOWE, the Rev. THOS. AINSWORTH, Mr. JOHN NEWSON, and Mr. HILLIARD, may be mentioned; nor ought the labours of the late PRINCE CONSORT in this direction to be omitted, as tending probably more than any other person, by his high position and his pure and disinterested motives, to have infused energy and excited inquiry in many minds that might otherwise have been directed into other channels.

Of the results of some of the above operations it may be briefly noted, that the Strand Buildings Company, on an expenditure of £5,000, pays $4\frac{1}{2}$ per cent.; the Central London Dwellings Improvement Company pays 3 per cent. on a capital expended of about £10,000; the London Labourers' Dwelling Society pays 5 per cent. on about £30,000 spent chiefly in renovating old buildings: and that of the private owners, Mr. HILLIARD receives from 6 to 7 per cent. on an outlay of about £14,000, and Mr. NEWSON is reported to have received a nett $5\frac{1}{2}$ per cent. on an outlay of £13,000 or thereabouts.

I am aware in this Paper I omit altogether any notice of cottage dwellings, both suburban and agricultural; but I should like to mention the Metropolitan Association have an interesting experiment in suburban dwellings at Penge. I trust some other Member of the Institution may be found willing and more able than myself to deal with this question. It is by no means second in interest and importance to the subject considered in this Paper; it also abounds with similar problems as to the difficulty of providing adequate accommodation for the humblest classes, at fairly remunerative rates.

With respect to the general results obtained from this Paper, I trust they may be looked at as on the whole encouraging. With a total sum expended in the metropolis of about £650,000,* housing approximately from 15,000 to 16,000 persons at moderate rents, giving an average return of $4\frac{1}{2}$ per cent. on 15 ascertained returns, with a death rate in a great proportion of reported cases much below the average rate of mortality in the metropolis, and considerably below the rate in the poorer districts taken singly, and with a rate of interest derivable not varying much from that receivable

* Not taking into account the £200,000 further given by Mr. PEABODY, not yet expended.

for freehold property elsewhere, I trust we may look to the future with hope.

In our varied relations as professional men, we may do much to help this work, and though of course we do and must acknowledge that no material and social progress can supply the place of higher influences, we can and do, I hope, recognize that the one should go hand in hand with the other, and I trust, as a body, we may ever be found taking a deep interest in such questions.

[NOTE.—The author of this Paper desires to express his warm thanks to those who have furnished him with statistical information.]

Previous to the Paper being read, Mr. V. BUCKLAND (Member) called attention to the Bills brought in by Mr. GOSCHEN, relative to the valuation of properties in town and country for rating purposes, and also to a petition to the House of Commons from the Corporation of London, by which the Corporation desired to introduce into a Bill now before Parliament a clause enabling them to issue one precept for a single jury to assess the whole of the interests in any property the City had powers to take compulsorily; and he asked if these subjects were proper to be discussed by the Institution.

The PRESIDENT agreed that the questions alluded to were of much public and professional interest, and thought if any Member would bring them before the Council or the Meeting for discussion, it would be a great advantage.

At the conclusion of the Paper, Mr. H. A. HUNT (Vice-President), moved a vote of thanks to Mr. CLARKE.

Mr. FRANCIS VIGERS (Member), in seconding the resolution, pointed out how much they were indebted to those who had invested money in the improvement of the dwellings of the working classes, and who, besides making the attempt, had proved that such dwellings could be rendered commercially remunerative, and he thought unless this point could be attained the movement would be a failure. He believed, however, that sufficient attention had not been given to the improvement of the dwellings of the very lowest classes, and he felt that, until they found some means of doing this, they would have made but a small step in advance. The attention of the Members had most likely been drawn to the bill introduced by Mr. McCULLAGH TORRENS, which passed into law last Session. That act, in his opinion, cut at the root of the evil, for it gave the chance of improving the dwellings of the very lowest classes, by enabling district boards or local authorities to give notice of repair to owners when buildings were found to be unfit for human habitation, and if the owners did not repair, then the local authorities had the power to repair them, and to make the cost a first charge upon the property. His hearers were all aware that the class of houses to which he was alluding were held by persons whose object it was to secure the largest annual rental, with the least annual outlay. Now, the effect of Mr. TORRENS' bill would be to teach such persons that property had its duties as well as its advantages, and that if they did not choose to hold it under the altered circumstances, it would probably be the means of transferring it into the hands of persons who would be satisfied with a smaller

rate of interest, and keep the dwellings in better order. He earnestly trusted that the gentlemen present would give the bill their careful attention, and do all in their power to bring it into useful operation.

The vote of thanks, on being put to the Meeting, was carried unanimously.

Sir SYDNEY H. WATERLOW (Visitor) said, he rose with considerable diffidence to speak on the subject, in the presence of so many professional men; but he was sure that they all felt indebted to Mr. CLARKE, for what he (the speaker) had no hesitation in saying was the best *résumé* with which he was acquainted of what had been done to improve the homes of the working classes of London. He trusted that no one present that evening, and who heard that £650,000 had been expended during the last twenty years (the larger proportion during the last five years), would feel for a moment that the work had been accomplished, or that they were any further than the threshold of their labours. All must be perfectly satisfied that there were thousands of families who were living in a condition, degrading to the parents and demoralizing to the children, under circumstances in which it was almost impossible to cultivate, among young persons, that sense of modesty which was the greatest safeguard to youth, whether in girls or boys. He was particularly anxious to elicit some expressions of opinion upon the different methods of construction which had recently been adopted in the erection of dwellings for the labouring classes in the metropolis, some particulars of which had been already given in the Paper. Although he (Sir SYDNEY) had taken a great interest in the question for many years, he certainly did not think that perfection had

been arrived at, either as regards economy or method of construction. Probably the large sums recently expended had been divided in something like equal proportions between two distinct and somewhat conflicting principles of construction, viz., that of the internal corridor, and that of the external staircase and passage; and it was time that some understanding as to the best method should be determined. In speaking of the internal corridor and external staircase and passage, he meant that by one they had internal ventilation, and by the other they had entirely external ventilation. He alluded to this subject boldly, because he was glad to see that Mr. DARBISHIRE was present, and he hoped before the close of the Meeting that they would hear some expression of opinion from him upon it. He confessed himself, to a strong feeling in favour of the external staircase and ventilation. He and his coadjutors had gone on the plan which gave the complete home with its separate scullery, closet, dust shaft, and indeed, separate accommodation of every kind, leaving to the tenant nothing in common with any other tenant. Another plan was to have lavatories, laundries, and closets, which were common to more than one family. There were advantages no doubt in each plan, but he thought they were greater in the case of separate conveniences, both in a moral and an economical point of view, for he found the occupants were always prepared to give a larger rent in proportion for separate conveniences. Then opinion was divided as to whether they ought to attempt anything like decoration in this class of tenement. He himself leaned rather towards the plastered walls and paper, because he felt the power of an argument once advanced by a workman to him, who said, "Is it not a shame that I, who have been engaged all my lifetime in decorating other men's homes, should have to live in whitewashed walls, and must not so much as put up a paper or a picture." It might

he said that the plastered walls led to an accumulation of vermin when the apartments were occupied by dirty people. This was true, and it led to mischief which it was difficult to eradicate, but then they had to educate these people. As an illustration he said, that at the buildings called "Langbourn Buildings," he first provided a separate water closet. Many of the tenants never had such a convenience before, and did not know how to use it. Some seemed to regard it as the receptacle for used-up scrubbing brushes and other refuse. At first there was considerable difficulty in keeping the closet in repair and in preventing its stoppage, but a little education soon taught the people how to use and to treat it properly. For the simple reason that such persons were willing to be taught, it was not right to rush immediately to the conclusion that the working people could not be trusted with a decent home as well as others. Then, as regarded the question of economy, he entirely concurred with Mr. CLARKE when he expressed his fears as to the power of capitalists to build homes for the humblest classes, and to obtain such remuneration as would tempt men to invest their money, with the hope of doing good, and not seeing it thrown away. He did not think it wise to build what he should call the lowest class of tenement, because he looked forward to the time when even the lowest classes of society would be so far advanced, and that too, long before the present structures had worn out,—that what was now the first class of labourers would have removed to still better dwellings, leaving those which were formerly occupied by them to the very lowest class. He also felt, that by providing first, second, or third class tenements now, they were in effect making more room, and therefore giving increased and cheaper accommodation to the lower classes. If, for

instance, the societies which had been alluded to in the Paper, or private individuals, went into a district where a thousand families had to be accommodated, and such a society or individual were to build two hundred homes, would they not, he asked, be assisting all those at the bottom of the social scale, by giving them more room, and also better dwellings than they had previously occupied? He had always contended that by building good homes for working people, they were in effect benefiting in the best possible way the lowest portions of society. He (Sir SYDNEY) heartily concurred in the remarks made by Mr. CLARKE with reference to the PRINCE CONSORT. He would not say, that to the PRINCE was due the first conception of the special construction of labourers' dwellings, but undoubtedly he was the first who developed it. Mr. ROBERTS had designed and erected, for the PRINCE CONSORT, the first cottage with semi-external staircase and balcony, which he (the speaker) regarded as one of the greatest improvements, and which facilitated to the greatest possible extent the construction of large blocks of buildings. Mr. CLARKE, in his Paper, had referred to the danger to inmates of lofty houses in case of fire. Referring to a plan of one of his model dwellings, Sir SYDNEY proceeded to point out how easy it was to ascend or descend the building without being materially inconvenienced, even when the whole bulk of the building was in flames. The staircase was of artificial stone, and was outside the external wall. The inmates might pass up and down it without passing in front of any window. If lighted, a fire could not communicate smoke to the next flat; it must go out into the open air, because there was no continuity of draught between one flat and another. He had tried the experiment himself by lighting shavings and pitch in the centre

of the stairs, and the smoke would not rise to other parts of the building; and if the smoke would not rise, the flame would not. He might also state, that the passages were all fire-proof as well as the whole balcony. Again, as an evidence that there was very little danger of fire, these buildings were always taken by insurance companies at the lowest rate accepted for any buildings whatever. With regard to loans, although the expenses in obtaining small amounts were considerable, he thought on large sums they did not seriously affect the results. His company had raised over £108,000. Government had promised £52,000, and he was glad to have the opportunity of stating, that the company were now in want of sites, and had, in fact, more money than they had schemes to exhaust it. They had the power too of raising money to almost any extent, so long as they made their undertakings profitable. They were not prepared to give a "fancy" price for sites, and they never commenced operations until they had calculated what the total cost would be to finish them, and saw the prospect of a fair return for their money. Mr. CLARKE seemed to think that the plan of repairing old dwellings had not been sufficiently developed, but he could assure his friend that there were many difficulties in the way which did not appear on the surface. Whenever old buildings, such as those occupied by the working classes, were put up on long repairing leases, there was always so large a number of bidders, it was almost impossible for any company to give the price which a private individual would give, and they were usually taken by some small jobbing builder, who was prepared to spend the smallest sum possible on their repair, and to exact by personal labour the largest amount of rent. No public company could do

that. As an illustration, only recently, when a large property belonging to Christ's Hospital was put up to tender, his company's tender was much less than the price offered by small jobbing builders in the neighbourhood. In these cases no capital was required. They could enter upon an undertaking of that kind with two or three hundred pounds, and by personal attention to the property make a good living out of it. In the case of his company, his experience was that they had always to pay the maximum rates. Jobbing builders managed to get upon Boards of Guardians, and to get their property assessed at a very much lower rental. He looked forward with considerable expectation that Mr. GOSCHEN's bill would bring about a more equitable mode of assessment. His desire was that all should be assessed alike, and he hoped that gentlemen who might sit upon such boards would not have the power of obtaining a lower assessment for property in which they were interested, and putting up other property to as large an assessment as they could. He felt that the subject mentioned by Mr. BUCKLAND was one of considerable importance, and he hoped the Institution would help Mr. GOSCHEN in obtaining a settlement of that very difficult question.

Mr. H. A. DARBISHIRE (Visitor) said he might, perhaps, be allowed to state the reason why the external corridor was preferred by those who adopted the general arrangement of plan which he had advocated since its first approval by the officers of the Guards in their Victoria lodging-house in 1854. The working poor are averse to ventilation, and their objection to fresh air in their dwellings is attributed by those who are conversant with their habits to the fact that, being actively occupied in physical labour during the day, their bodies become heated—sensitive to

cold when their labour is over, and when they return home they desire to retain their bodily heat as far as possible, and with the least sacrifice of fuel. Sir SYDNEY WATERLOW looked forward to the time when the lowest wage class would be so greatly improved as to be able and willing to occupy the superior dwellings of those immediately above them in the social scale; but, without waiting for that improvement, Mr. PEABODY, Miss BURDETT COUTTS, and others, were anxious at once to provide for this class, which included scavengers who were in receipt of 15s. a-week, and others of kindred employment and remuneration. The highest wage class for which they wished to provide consisted of persons in the receipt of not more than 25s. per week, and all these were employed in corporeal labour during the whole of the day, and came home warm. Now, by having external staircases, galleries, and approaches to the dwellings into which the windows and front doors opened, the people found their rooms draughtly. It was, of course, necessary that ventilation should be provided, and to meet that want, and avoid the complaint of draught, a central corridor with windows at each end, and an open staircase in the centre of the corridor, had been provided. When, therefore, the inmates opened the front doors they could not help getting a little fresh air, even if they kept the windows shut. Their aversion to ventilation was so great that small openings in the walls provided by perforated bricks so arranged as to prevent through currents, were almost always stopped up by the tenants. Mr. CLARKE, in his Paper, had stated the mortality at 15 or 16 per 1,000, and he had no doubt that if the inmates of the dwellings would submit to more perfect ventilation it might be rather less. In considering Mr. PEABODY's plans the public were apt to think that it was not the lowest wage class for which his build-

ings were provided, but yet such was the case, and, speaking from an experience dating from 1854, he had no hesitation in stating that the buildings were inhabited by the lowest wage class. The object which Mr. PEABODY and Miss BURDETT COURTTS had in view was rather different from that of Sir SYDNEY WATERLOW, because the former wished to raise those who had hitherto been accustomed to the very worst accommodation just one stage above that bad accommodation. In the buildings erected by Miss COURTTS great difficulty was at first experienced in getting people to go into the buildings. They loved the haunts to which they had been accustomed, and, therefore, it was considered desirable to wean them by degrees to habits of cleanliness and decency by supplying them with accommodation not so much greater than that which habit had made acceptable as to deter them from adopting it gradually. The buildings had been filled and the applications were now so numerous that the superintendent had considerable difficulty in making a selection. With regard to the cost he would say that in the buildings just completed in Westminster, the cost per room had been £72 8s. 6d.; the average population was 4.1 per family. In this case they had devoted the topmost storey to laundries and wash houses, the whole of the intervening space being devoted to drying grounds. They found also that it was advantageous to devote four stories to dwellings, and the fifth to laundry purposes. In making a calculation of the accommodation given to their tenants, the uppermost storey was a dead loss to the rental and a complete gain to the tenant, and when it was said that the dwellings paid only $2\frac{1}{2}$ per cent., that fact should be taken into consideration. Another fact which tended to mitigate the dividend was, that whenever a tenant fell ill from rheumatic fever, or any unavoidable cause, his rent was not exacted, he was not

ejected, nor was his furniture sold. His rent was remitted, which, of course, was a loss to the revenue; and remembering all this, it was, he thought, rather creditable that the return on Miss Courts's buildings should be fully $2\frac{1}{2}$ per cent., especially when it was also taken into consideration that 3s. 6d. was the rent for two rooms. With regard to separate accommodation, which was insisted upon by some persons, he would say at once that he had always most strongly objected to providing all domestic conveniences in the limited space allotted to the dwelling of a family of the lowest wage class. Those who provided for the lowest wage class had to take into consideration the habits of that class. Experience had shown them that if they provided a water closet, sink, washing copper, and dust shoot to each such family, those conveniences would be used for purposes for which they were never intended. Therefore they found it desirable to give one water closet, one lavatory, one sink, and one water supply to two families, and not more, and to place these in such a position as to isolate them from the building as far as regard for their convenience and usefulness would permit. At the buildings at Westminster all these arrangements were external to the dwellings, and by an arrangement of permanent openings and windows, by which cross currents of air were established, all the effluvia was effectually got rid of, and prevented from entering the main building. It had been urged that, in cases of sickness, the situation of these requisites was inconvenient, but he submitted that all excretions are better removed from, than contained within, the dwellings. In this opinion he was borne out by Dr. SUTHERLAND of the War Office, who considered it a most essential point that all these conveniences should be away from the buildings.

Mr. J. BAILEY DENTON (Member) said that the discussion had been confined to buildings in the metropolis; and he was afraid he should be out of place were he to go into the question of agricultural cottages, with which he was more connected and in which he was very much interested; but he certainly would not like the discussion to close without directing the attention of the Members of the Institution to that question. He found the average number of persons occupying agricultural cottages was 4·4; and he was very well satisfied, after hearing what had been said that night, that the cost of those cottages, taken at an average of £150 each or £300 a pair, being about £35 per person, exclusive of site, was not excessive. He had tried very much to get at the lowest cost of cottages by encouraging competition. The result of that experiment was to show that cottages could not be built in the rural districts under an average of £150 each, although professions had been made of building cottages as low as £100 each. It would be interesting, he thought, to the Institution if he stated that, on one of the occasions when prizes were offered through the Society of Arts for the cheapest agricultural cottages that could be constructed, in which the President had acted as one of the judges, there was one prize awarded Mr. BIRCH, which afforded a good test of cost. The result in that case was this—the prize was given professedly for plans of cottages that could be built at £200 per pair. The President and his colleagues were of opinion that the plans exhibited were not such as could be executed for any such price; but that it was probable that the plans, if executed, would cost from £270 to £300 per pair. Experience had proved the accuracy of this decision. The plan for which the prize was given has been carried out. The first cottages built on this plan were not erected under £400 per pair, although

it was professedly stated that they could be built for £200. Other cottages, on reduced plans, had been built about the country, at prices varying from £270 to £340 the pair, verifying precisely the accuracy of the judges' decision. He, therefore, thought he was right in saying that experience had proved that £300 fairly represented the cost of a pair of agricultural cottages. There was no need for him to say that labourers could not afford to pay the rent which was necessary to repay within the period prescribed by Act of Parliament the cost of money employed in building those cottages. That, according to the rate of charge made for money borrowed, at 6 per cent., gave £9 a cottage. A farm labourer generally paid £4, which left £5 for the landlord and tenant farmer to make up. Much was said about the possibility of building cottages at £100 each; and many landowners were of opinion it could be done for this. At the Inclosure Office, there existed an excellent collection of plans of cottages which might be useful to the country at large, if the public could only get at them. There were in that office plans by nearly every rural architect in England, which had been executed in various parts and at various costs. He would suggest to the Institution whether it was not possible, through the influence of its Members, to get at that information which was thus buried.

Mr. C. GATLIFF (Visitor) said the Association with which he was connected (the Metropolitan Association for Improving the Dwellings of the Industrious Classes) having recently built between 160 and 170 cottages at Penge, he was in a position to state generally what was the result. That result bore very much upon the subject of the Paper which had been read. There was a large number of mechanics employed in London whom necessity compelled to live

there, but then there was also a large number who could reside in the country. For instance, compositors and men on piece-work, who were able to take the work with them and do it at their homes. These men, as he had said, could live in the country, arrangements being made with the railway companies for conveying them to and fro. The cottages which had been built by his company had cost £280 per pair for five-roomed cottages, and £320 per pair for six-roomed cottages. The railway companies had shown themselves willing to come to an arrangement. At present his company has 80 or 90 tenants, and, while there were so few, the railway company charged for conveyance 2s. per week. When, however, the whole of the cottages were finished, it was hoped that the cost of conveyance might be reduced by 1s., or at least 6d. a week. The rents charged for the cottages were 6s. 6d. for a five-roomed cottage, and 7s. 6d. for a six-roomed cottage; and the accommodation, besides embracing every convenience, also included a large piece of garden. They were semi-detached, and had a frontage of 20 feet by a depth of 90 feet. The rents charged would, it was calculated, yield a profit of about 7 per cent. Regarding the separate conveniences, the speaker said he quite concurred in the opinion expressed by Sir SYDNEY WATERLOW, that separate accommodation was much to be preferred. Mr. CLARKE had entered so fully into the results of dwellings in London, that he need not occupy the attention of the meeting on that point; but, as regarded cottages in the country, he thought it might interest the Institution to know that the railway companies were anxious to encourage such buildings, and would be found willing to come to some reasonable terms as to the conveyance of workmen. Already several of the companies

were running trains starting at five in the morning, and arriving in London a quarter before six; and in the cottages belonging to his association they had tenants of that description who regularly went backwards and forwards.

Mr. H. A. HUNT (Vice-President) said that many years ago he erected a large number of buildings at Stratford upon the principle indicated, which he remembered cost about £150 a set. These flats were composed of rooms, various in number, from two to five apartments. The buildings were two stories in height, and were occupied chiefly by the work people connected with the Great Eastern Railway. He found considerable difficulty in persuading the work people to live in the houses. They had objections of various kinds to urge against a change of residence. Ultimately the railway company sold the houses, and how they were occupied now he did not know. Some years ago also, as surveyor to the Duchy of Cornwall, he called attention to the condition of a block of buildings contiguous to the South Western Railway. He found them inhabited by the poorest class of persons. The shops on the ground-floor, together with the other rooms from the basement to the top, were occupied by the very poorest classes. The houses were so insufficiently drained, and in such a bad condition, that he had them pulled down and rebuilt. The late PRINCE CONSORT suggested that they should be adapted to the use of the poor, and accordingly this was done. Finding the shops had let well under the old *régime*, they were retained in the new structures. The same plan was adopted for building flats, with the rooms various in number as before. They were self-contained, that is to say, each had its water closet, scullery, washhouse, and so on. He thought they cost

about £150 the set. It was expected, of course, that having improved the character of the dwellings that there would be no difficulty in letting them. He found, however, that they could not be let at all, and the shops which were occupied throughout before did not let, and have not been let to this day. He inquired of poor people who lived in wretched wooden houses in the neighbourhood, why they did not move into some of those nice dwellings; and the reply was to the effect that they much preferred to be as they were, that their children were healthy, and as for the buildings they were a great deal too fine for them. He passed them frequently now when going by the railway, and he thought both shops and dwellings were still badly occupied; and therefore, looked upon in the light of a speculation, the attempt was unremunerative. With regard to what the last speaker had said in reference to the cottages at Penge, upon which the association got 7 per cent., he thought it a very profitable investment, particularly as they had borrowed considerably of the Loan Commissioners at 4 per cent. Of course the advantage which they got was that the ground upon which they built their dwellings was comparatively small in price, when contrasted with the value of land in the metropolis. He thought it would be a great advantage to the working classes if the system adopted at Penge was more generally carried out. There could be no doubt that it was a great advantage for the people to be able to live in the country, and if they were to judge from results, the experience derived from Penge was very encouraging. He was also of opinion that the buildings erected at that place were far preferable to the gigantic structures now dotted about various parts of London. As regarded the question of the corridor, he did not quite agree with Mr. DARBISHIRE, in thinking that it

was a reservoir for fresh air. He thought there was a great deal more fresh air in Sir SYDNEY WATERLOW's dwellings, which, in his opinion, afforded much better ventilation.

Mr. CLARKE, after expressing a regret that time would not permit one or two more gentlemen, who would have liked to have addressed the Meeting, to make a few observations, first alluded to that part of the discussion which had dealt with loans, and reminded Sir SYDNEY WATERLOW, that the remark made by him was taken from the report of that gentleman's society, but he had learned that the views expressed therein had been considerably modified. Passing to the question of the relative merits of Sir SYDNEY's and Mr. DARBISHIRE's buildings, Mr. CLARKE said he had purposely left the point untouched, because he felt sure that it would be brought out in the discussion. He would not now detain the Meeting longer, but begged to express his thanks for the interesting discussion which had followed his Paper.

The PRESIDENT said he was sure the Meeting was greatly obliged to Mr. CLARKE for his able and interesting Paper, and to Sir SYDNEY WATERLOW, Mr. DARBISHIRE, and others who had taken part in the discussion. He believed with Sir SYDNEY that the work was only just commencing, but he would state that, although he had some considerable experience in town properties, his experience in early life was almost entirely confined to country cottage property. But he found that the same habits attached to both the town and country poor. They all liked to have a self-contained house. He found, even in the country districts, where there was frequently only one oven there was almost

invariably a quarrel. The poor could not even bake in common, and much less could they amicably perform other offices. It was a matter of expediency in all cases to provide as much separate accommodation as possible for each family. Recently in London he had taken charge of a very considerable property in which there were many hundreds of poor cottages, some so poor as to be hardly credited. They were left in a sad state by the last lessee, and much difficulty was experienced in getting them put into a state of repair; a great many they were obliged to pull down. A portion of the property had been used by Sir SYDNEY in erecting those dwellings which were of so useful a nature to the poor. He confessed to having a strong partiality for having open staircases instead of internal corridors. He had observed that in Mr. CLARKE's Paper nothing was said relative to the average cost of providing each separate room. He thought it scarcely possible to arrive at any exact result as regarded the population of these dwellings. It varied exceedingly; but if by some means they could arrive at details connected with these two points it would be of great advantage to them. There could be no doubt that the PEABODY trustees and Miss BURDETT COURTS had done great good in providing residences for a great class of persons; but, after all, they must look to the commercial element of the matter. He did not think that the movement could ever be carried to any great extent unless it were shown that the outlay of capital in workmen's dwellings produced a moderate rate of interest. In his transactions he found that the greatest part of the cottages were farmed out, and that the labourers were paying far beyond the prices charged for accommodation in the admirable dwellings of Sir SYDNEY WATERLOW and others. He hoped that there would be less and less of that system of farming out cottages which was at one time so common, but

he did not think it so now. He had had many opportunities of seeing the model cottages of the late PRINCE CONSORT, in the neighbourhood of Windsor, which provided most admirable dwellings for the poor. He had no doubt that the wish of Sir SYDNEY would be realized, and that, as they raised a better class of cottages, the best class of workmen would get into them. The dwellings previously occupied by them would be occupied by other workmen of a lower class, who, in their turn, had improved in their tastes; and so a general reform would be brought about, and all would be somewhat raised in the social scale. He was in hopes that the Metropolitan Association would soon become a great undertaking. As to what had been said about the railway companies, he had no doubt that matters might be arranged to the mutual benefit of themselves and of the workmen, whom they would find it to their interest to convey at greatly reduced rates.

AT

THE ORDINARY GENERAL MEETING

Held on Monday, April 19th, 1869,

The PRESIDENT having inquired if any one had further observations to make on Mr. CLARKE's Paper read at the last Meeting,

Mr. E. RYDE (Member) said, he should be sorry if the subject dropped without having it placed on record that the discussion had been very imperfect. The important question as to whether it were better to increase the accommodation for the laboring classes, by erecting higher buildings in London, or by providing cottages in the suburbs, being scarcely touched upon. The subject of agricultural cottages was, also, a most interesting one, and it might be divided into two sections, viz.:—those for laborers who were constantly employed on estates, and for whom, it might be said, the landowners themselves should provide accommodation,—and those for the class whose occupation was more varied, and who lived in agricultural villages. He hoped, at some future time, the subject would be again taken up and further discussion provoked.

Mr. J. B. BIRD observed, that within his experience, in a locality where the customary rent of laborers' cottages was 1s. per week, improved cottages had been erected for which the money was borrowed at 6 per cent. These cottages, in consequence of the conditions imposed with the loan, were so good that they would readily let at £10

per annum. This was far beyond what a poor man could pay, and it was very difficult to induce the farmers to let them at the smaller rents to the class for whom they were intended.

The PRESIDENT regretted that, in consequence of the approaching termination of the session, it was necessary that the discussion of this interesting subject should be closed somewhat abruptly. He hoped, however, to see the matter again taken up at an early period of the next session.

With reference to a question which had been raised at the last Meeting, the PRESIDENT announced that the Council had determined, if a Member wished to bring forward any subject of general or professional interest, and gave proper notice to the Secretary, the Council would endeavour (if the matter was deemed of sufficient importance,) to set apart some portion of an ordinary meeting, or appoint a special evening for its discussion. It was clearly undesirable to open a discussion without notice, and so occupy time which had been otherwise appropriated.

THE
SANITARY TREATMENT OF THE
REFUSE OF TOWNS,
AND THE
UTILIZATION OF SEWAGE.

BY WILLIAM MENZIES, MEMBER.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
April 19th, 1869.*

THE PRESIDENT IN THE CHAIR.

IN attempting to treat of the methods that should be adopted in dealing with the refuse of human dwellings and attendant buildings, it appears to me that the subject is best taken up under the following divisions:—

- 1st. Cottages.
- 2nd. Villages.
- 3rd. Isolated dwellings of the upper classes.
- 4th. Towns.

Having lately published a small work on the system which should, in my humble judgment, be followed, and the legislation which might be attempted to regulate the condition of houses falling under the two first divisions, it is unnecessary further at present to allude to that part of the subject.

The course which should be adopted for dwellings under the 3rd head, viz.:—that for isolated houses of

the upper classes, will naturally develop itself, when I proceed fully with my remarks upon the 4th division of the question, and to that, viz.:—the treatment of the refuse of towns, I intend entirely to confine myself in this Paper.

The first question that may be asked is, "What a Town?" My investigations would lead me to think, that when there are some such number as 2,000 people living upon an area equal to the half of a square mile, or 320 acres, the community may be spoken of as residing in a "Town" and not in a "Village." From that number the population increases in density, until we have, in some cases, 100,000 on a square mile.

By way of illustrating the subject, we may very properly take a town with a population of 10,000 living upon a square mile, which is something like the average of English towns.

It is also necessary to define what the refuse of such towns includes.

Under the general name of "Sewage," properly so called, are included the whole excreta of the inhabitants; all refuse water from houses, baths, washings of butchers' yards, the liquid part of stable drainage, and, in fact, all polluted water. This polluted water is principally the result of the use by the inhabitants of the water supply to the town, which we may assume, on a general average, at 20 gallons a head. The term "Sewage," however, has hitherto included more or less of the rainfall, the washings of the streets, and the water from the roofs of the houses, and it is important to bear this in mind in the course of the following Paper, as I have at first used "sewage" in its popular sense, inclusive of the rainfall, and have afterwards, for reasons which will become apparent in the course of the discussion, carefully distinguished between sewage properly so called,

and a compound of sewage and rainfall mixed. I may say here, also, that it is proposed to leave out of the discussion, for the present, all reference to seaside towns, and confine myself to the much more difficult question of the consideration of those in the interior of the country. Although allusion will subsequently be made to this part of the subject, I shall also assume as a general conclusion, that this sewage is not to be discharged into a river until it has been purified.

In proceeding to consider the method of treatment that should be adopted with "sewage," using the word in that more general sense, the subject divides itself into

- 1st. The questions affecting the Public Health that attend upon the Management of this Sewage.
- 2nd. The efficiency and cost of whatever system is adopted for its removal.
- 3rd. The mode of dealing with this Refuse when so removed.

The first principle, and one which will be almost universally accepted as of paramount importance, is that the removal of sewage should be complete, continuous, and safe, in all weathers, and in all seasons, without injury to the public health; and the second, that the sewage should produce, if possible, some return, when applied to the purpose for which nature evidently designed it, viz.:—the fertilization of the earth, from which mankind derive their food.

Naturally this sewage has a pungent smell,—the warning to us to remove it, and disease and injury immediately follow on a neglect of this law.

It is principally after decomposition has commenced that the greatest danger arises. It has even been stated by Professor ROLLESTON, of Oxford, that he believes the effluvium arising from the evacuations of cholera patients,

when quite fresh, is not capable of communicating the disease; but this power they gain on the second day, showing that nature has given time for the removal.

It can scarcely be supposed any one would maintain that a system of treatment by cesspools, or such like methods, could compare with one of perfect and constant removal, and immediate incorporation of the matter with the earth.

I shall, therefore, pass on at once to the consideration of the only two general systems that appear to deserve consideration, viz.:—1st, That of removing this sewage by means of earth; and 2nd, That by means of water.

1st. *The Earth System.*—Under the earth system, the human excreta are proposed to be removed specially from each house in detail, while all the other matters which I have included under the name of sewage are to be treated in some manner by drains. It is highly probable that if this earth system had been in general adoption, the sewage difficulty would have been deferred for years; but the question we have to consider is—Does it now meet all the requirements of the case? If the excreta alone are removed, what is to be done with all the other refuse? It clearly ought not to be poured into the rivers. Being liquid, it must be removed by drains. Moreover, with respect to the excreta themselves, in a town of 10,000 inhabitants, there would be a great many of the upper classes accustomed to the luxuries, it may be said, the essentials to weak and sickly people, of closets upstairs and over their houses. It is not likely that they would submit to domiciliary visits, such as would be necessary under the earth system; and as, evidently, a law could not be passed compelling the whole community to adopt the earth process, the sanitary authorities in almost every town would have to provide for the management of both an earth and a water system, and it is difficult to conceive how such

arrangements could be worked economically, except under some special circumstances.

Then, again, the 10,000 people would require at least 5,000 tons of earth annually, dry and sifted, and there is a great uncertainty as to where this could always be procured. Much is said about the quantity of ashes that such a town would of itself produce; but it must be recollected, in the crowded dwellings of the poor in towns, where, especially in summer, the quantity of ashes would be very small in comparison to the number of people residing in each tenement, a vast quantity of earth would have to be provided. It must be admitted that there would probably be a saving in the water rates by the adoption of earth closets, also that the fitting of them up in houses would, as a general rule, be less expensive; but, on the other hand, looking at the question as a whole, the other refuse matter must be removed and dealt with by a system of drainage, and the carriage of the excreta by suspension in this floating material, does not add so much to the cost of such removal as would be at first supposed.

I could not admit that the water system cannot be made perfectly safe for the inhabitants, and successful in the utilization on the fields.

The feelings of the upper classes on this subject must also be considered, as they have a decided preference to the complete washing away of all impurities. Many other practical difficulties suggest themselves in the way of working such a process, and I am forced to the conclusion, that however excellent the earth system may be for cottages, growing villages, establishments built upon land belonging to such establishments, and all entirely under the supervision and perfect control of one supreme authority, with full power to enforce his regulations, and to visit and inspect when he pleases every portion of the building under his charge,

I cannot see my way to recommend the attempt to be made in any such specimen town as we have selected; but must leave it to some one who has more confidence in the success of such a scheme.

Before proceeding to consider the question of water carriage of this sewage, it appears desirable to state generally my views on the treatment of such sewage at the outlet. Vast sums of money have been spent in attempting purification by means of different processes, such as by using milk of lime, carbolic acid, animal charcoal, and a vast number of other substances which need not be mentioned; but universal failure followed, and it seemed to have been working against the natural law, that vegetation is the great purifier of all refuse, and that living plants shall build up again into some useful and safe shape the polluted matter which is discharged from human dwellings. Any one who has been bred an agricultural engineer and surveyor, naturally looks to the fields at once as the only safe agent to be entrusted with this work of useful purification.

In now proceeding to speak of the systems of water carriage for this sewage matter, and considering them in their different aspects, a short history of the drainage of towns seems desirable.

Until within the last thirty years the only drainage which existed in towns was for the rain and surface water alone, and the inhabitants were strictly watched to prevent their passing any sewage into these drains. In the rude but emphatic language of the law, "Every man should keep his dirt at home." The introduction of the water-closet, however, gradually increased the water, which overflowed from the old cesspools to such an extent that it was impossible to prevent overflows of this description, and systems of drainage were designed to carry off the whole, both sewage and rain

water. A composite system of drainage then arose—generally the bed of some stream or natural ditch passing through the town was covered over, such for instance as the Fleet Ditch in London, and the whole filth passed into that along with the rainfall of the country. This soon was found unsatisfactory, because the flood waters of the stream were not to be relied on to keep the channel clear, and so the filth remained festering underneath the ground, giving off deadly gases in the midst of the population. The next arrangement which succeeded to that system was to plan large drains for the rain and surface water and sewage together, and, still keeping the idea of the size of the bed of a natural stream before them, engineers thought it necessary to make all the main drains large enough for a man to pass through them and keep them clean. Seeing the vast quantity of sand and grit that was occasionally washed off the streets, something might be said in defence of this system. Vast numbers of these great main sewers still exist. Into these sewers all the smaller house drains were made to enter, and the surface water through street gratings as well. The ordinary water used for domestic purposes and the occasional rainfalls were relied upon to flush these large main sewers ; but their great size made this an exceedingly difficult and uncertain process, and they, in fact, became only cesspools elongated. In dry weather the filth was retained in them to such an extent that, after heavy rains, chemical analysis showed that the water which was discharged contained frequently twenty times the amount of human fæcal matter per gallon more than it did in dry weather. This state of things, added to the fact, that long continued dry weather was always attended by an increase of deaths from typhus and other fevers, clearly showed that something more must be done. A further step was then taken by sanitary engineers. The idea of men passing up the drains was set aside, and the smallest possible drains

were constructed, until these have arrived at such dimensions as an eighteen-inch main drain for a town of 10,000 inhabitants. The rainfall was still to be relied on to a certain extent for flushing purposes, but a supplementary assistance was to be given at some points by flushing with water from the ordinary regular supply of the town. As these smaller drains were not sufficient to carry off all the surface and rain water as well as the sewage, overflow weirs were provided at certain points, where the excess was made to go over and pass away into some other channel. This is the system now most generally adopted, and is better than its predecessors.

Every one must admit the great benefit to the towns themselves that has resulted from the general adoption of systems of drainage and other sanitary measures. Although there appear to be exceptional cases, which are very puzzling, it is impossible to deny the fact; and the latter mentioned system has, apparently, judging by the mortality tables, done more good than the former. I believe that the systems of drainage hitherto adopted in England have been better than anything similar in the world, and that we must proceed most cautiously before proposing to change them; at the same time we must keep before us constantly the question, "Have the present systems fulfilled all the requirements of the case? and will they, if followed out, solve the difficulty in all its aspects?" My own feelings and conviction lead me to think they do not, and some of the evils which they have entailed will now be mentioned.

Speaking first of the oldest system, by which all the rainfall of the streets and houses is conveyed into the same large main drain as the sewage matter; and although London has been drained upon this system, I cannot but dispute its propriety. In any town which has thus been dealt with, a great portion of the road metal used in the streets passes down into the drains, and as the gradients of these drains

must be low in England, which is especially a flat country and has its principal towns situate by the sides of rather sluggish rivers, deposits of the most putrid description, of sand and sewage mixed, are formed at the bottoms of the drains, and decomposition proceeds underneath the feet of the inhabitants, while the foul air in its most dangerous form comes back either into the houses of the rich, or into the back courtyards where the poorest people crowd together. Neither ordinary, nor indeed any rains, can wash this filth away as it lies in a clammy mass and constantly chokes up the pipes. It is also necessary to send men in to clean out the drains, and such a system ought no more to be continued than the practice of putting children up chimneys, although it appears that the health of these men as a body does not specially suffer from their occupation. Nothing could be less satisfactory than reliance upon rainfall for flushing purposes, because during long hot dry weather, lasting sometimes for six weeks at a time, when the drains ought to be especially kept clean, it is obvious that the flushing by rain is not available, just when it is most wanted.

In confirmation of this view, it may be remarked that dry years are generally unhealthy ones, and it is recorded by Dr. ACLAND, of Oxford, in his most valuable account of the cholera in that city in 1854, that in the neighbourhood of London, in the year 1832, memorable as the period of the first visitation of that disease, there was a deficiency of seven inches of rain; and in 1854, the period of the second visitation, there was near London a deficiency of nearly six inches of rain; while at Oxford, in 1854, where the disease was so malignant, there was a decrease of nearly ten inches of the annual average rainfall. From which facts we may safely conclude that all reliance upon rainfall for flushing purposes should be set aside.

Even this system, however, of rainfall and sewage mixed, with its large drains to take the whole, had to be provided with overflows at different points, and these, as will subsequently be explained, when speaking of the drainage of the towns in the Thames Valley, are a great source of danger to the community.

Under such a system, the attempt to deal with the discharge at the outlet for agricultural purposes is attended with enormous, if not insuperable, difficulties. In the first place, the retention of a considerable portion of the sewage in the drains until it is washed out by the rain, sends down vast quantities of putrid matter, which it is dangerous to deal with in the fields; but, more especially, the quantity is so exceedingly various and uncertain that no possible system can be devised of economical and efficient management. It must always be remembered that the process of utilization must not be one in which we are to have a choice of following it and leaving it alone as we please, but must be complete, perfect, and economical, if possible, both in the fields as well as in the towns, so as to satisfy all the requirements of the case.

Now the rainfall records (and here testimony must be borne to the valuable labours of Mr. SYMONS of Camden Town, in elucidating this subject) have variations which one would scarcely expect.

We have periods of drought of six weeks, in which there is no rain; and, again, we have had instances of an inch of rainfall in ten minutes, and six inches in a month. Now, although it is true that a very considerable proportion of such rainfall falling upon a town would be absorbed in the gardens and streets, and also that the rush of the rain would not arrive at the outlet in the same space of time as it falls upon the drainage area; yet, making all allowances, how could such a flood be managed economically, if indeed it

could be done at all, especially if pumping has to be resorted to, to get this sewage on the fields, as must be the case in so many towns?

Subject to these modifications, I may, as a further illustration of the suddenness with which such rainfall and sewage when conjoined may arrive at the outlet, refer to the rainfall of a thunderstorm which passed over London in May 1868. Mr. SYMONS records that $\frac{9}{10}$ ths of an inch fell in half-an-hour, and during part of that half hour it fell at the rate of six inches an hour.

As an illustration of the quantity which may be discharged upon the land under such a system, let us take the month of December 1868. Allow me to assume for a moment that the drainage of 100 people is to be utilized on an acre, and that we are dealing with the specimen town of 10,000 inhabitants, living on a square mile. This would require 100 acres. Let us also make the large deduction of saying, that one-half of that rainfall of six inches which fell in that month on the town itself would be absorbed by the gardens and streets inside the town, although it could not be so much from the whole air and ground having become saturated with water.

These 100 acres, then, during that month of December, would have had to receive, first, its own rainfall of six inches, which you will admit would have been a very ample drenching; then the land would have spread over it, secondly, 20 gallons a head of the sewage and refuse water from the 10,000 inhabitants every day during that month; and, thirdly, as much rainfall from the town as would lay the whole 100 acres 18 inches deep in water. It cannot be supposed any one, as an agriculturist, would say that such a system could be beneficial, and, if pumping had to be attempted of the two latter quantities it would be simply impossible. The beneficial effects of vast quan-

tities of water flowing over water meadows may be quoted against these views; but there is this vast difference between the two cases, that, in water meadows the irrigation is entirely under control—can be put on and taken off when wanted; but, under the circumstances we are considering, no control whatever can be exercised, but the quantity must go upon the land whether wanted or not; and all agriculturists will surely agree that, if you must take the sewage every day in the year, and dilute it per head of the population in its 20 gallons of water, or what would fill an ordinary stable pail six or eight times, the most profitable and perfect system of utilization would be arrived at; and this, it is submitted, is as much a matter for consideration in its pecuniary aspect as the cost of the drainage in the town itself.

In proceeding to discuss the second system of drainage previously adverted to, viz., that of having very small pipes, only sufficient for the dry weather flow of the sewage, and providing for the wet weather discharge by sending the contaminated mass into some stream or ditch by an overflow, it is more difficult to produce a clear impression. It is obvious that the variations of such a system must be endless, and I would much rather give my opinion of it in the broad terms that, the nearer it approaches in any case to the older system of putting all the rainfall into the same drain as the sewage, the worse it is, and that I would much rather leave you to form your own judgment on its merits after I have endeavoured to explain to you the system, which I trust I am not assuming too much in saying that if not for the country generally, at least for the Thames Valley, I may take the credit of having introduced. That system is, that the rainfall shall in all cases, as a principle, be entirely separated from the sewage; the rainfall being conveyed to the nearest outlet, and the

sewage to the most appropriate land for utilization. It has come to my knowledge that this system had been spoken of and discussed before I took up the subject, and it is not my wish to detract from the merits of those who advocated it; but on proceeding to investigate the matter, at least twelve years ago, I had never heard of it, and the "discovery," if it may be so called, was the result of intense labour on my part. On introducing it to the public notice, in 1865, I found few supporters, and encountered much ridicule. I trust I shall be excused alluding to this, as, should it fortunately succeed, it will probably be stated—as has been to a certain extent already—that it was borrowed from other people which, speaking very honestly, it was not.

Under the system of separation of rainfall from the sewage, the first advantage anticipated is that there will be no gullies or openings into the streets communicating with the foul drains by which effluvium can rise into the streets or court-yards. The second, that men will not require to enter into the drains, to clean out the sand and grit off the roads. The third, that no overflows of foul or sewage matter will be necessary. And the fourth and most important, that the treatment at the outlet by irrigation will be uniform, economical, and practically perfect. The fifth advantage is, that perfect and continuous removal of all sewage may be secured by a complete system of flushing, under command at all times and at all seasons; and it is worth observing that the greatest flushing will be necessary, or, rather, desirable, in the town in dry weather, just when the fields outside will take it best. The sixth advantage is, that when pumping is necessary, as it is in such a vast number of cases, the economy will be very great.

The objections that have been raised to this system must be noticed.

The first is, that the water off the streets will be so polluted as to be unfit to be poured into a stream ; to which the answer is, that the streets ought therefore to be thoroughly scavenged, as it cannot be maintained that any filth is to be left there till the rain washes it away.

The second objection is, that it will be enormously expensive to provide two sets of drains. This might be answered at once, by saying that efficiency is the first essential element ; but the question of expensiveness is open to full consideration. Every town, before it is drained for sewage purposes, has a system of surface drains of some sort existing, and the new sewage drains may therefore be reduced to the smallest size, for removing the sewage alone, instead of being capable of removing sewage and maximum rainfall mixed. I shall allude to this more particularly hereafter, when speaking of the drainage of Windsor, Eton, and Oxford. We must look at the expense of the process from first to last, keeping in remembrance that the whole question is one affecting the rates on the town itself.

The last objection which has been raised is, that it is stated to be impracticable. On that point I would merely ask—"Has it ever been tried?" or, "where it has been tried has it failed?"

I hope to be able to convince all of my hearers that it is worth a trial, at least.

Without, however, perfect ventilation and flushing, such a system, or indeed any system of drainage should never be attempted.

It appears to me that it is not stating the case too strongly in drawing the conclusion that the possibility of utilizing the sewage, nay more, the possibility of getting rid of it at all in an inoffensive form, at a moderate expense, now that the rivers are closed against it, depends upon the control exercised over the quality and quantity of fluid, and the regu-

larity of the flow in the drains. In other words—show me a town with a regulated supply, such as would be the case under the separate system, and the cost and mode of purifying the sewage may be proved to demonstration. On the other hand, if overflows are forbidden, as they ought to be, on sanitary grounds, no engineer could point out the mode of dealing effectually with the sewage of any large town, as London, for instance, unless he had some such place as Barking Creek into which to pour the impurities when they were beyond his control.

It has occurred to me, however, that instead of further enlarging upon the abstract merits of the different systems of drainage by which the sewage is to be conveyed to the outlet for treatment on the land, it might be more advantageous, and give a clearer conception of the different matters under discussion, if I attempt to narrate the history of the drainage question in the Thames Valley, with which I have officially been much concerned. My statement must necessarily be as concise as possible, but every one can refer to the vast amount of public documents relating to this part of the subject, from which quotations are made.

The Thames Valley must take precedence of all others in the kingdom, and for a long time it was evident that the drainage question, just like the battle of the gauges, must be fought out in that district. When, about thirty years ago, as previously stated, sanitarians first began to show that covering up a nuisance was not getting rid of it, and to insist upon the abolition of cesspools and the removal of sewage by suspension in water, the great problem was to get it sent anywhere else than where it was. The probable injury to rivers or water supply, and the loss to the country generally of the sewage matter, had not been thought of or investigated, and the most pressing evil was taken in hand first. It appeared, therefore, the simplest, and on the face of it, at first sight,

the most reasonable way to make one monster set of drains to carry away rain, subsoil-water, and sewage, because the more diluted it all was, the better it would be, and the less innocuous. Endless discussions ensued, but the result was, that about twenty years ago, Windsor in the Thames Valley went first, and was followed by Eton, in completing an elaborate system of drainage, the population of the former at that time being probably about 8,000. It would be impossible to say what the cost was; but had Windsor borne its share of the main drain which was constructed by the Crown, it certainly would not have been under £15,000. Eton followed at a somewhat less cost.

Oxford made several attempts within a few years after that, under the guidance of Sir WILLIAM CUBITT, but as he recommended something of the same system as had been followed in these two other places, and proposed to discharge the whole into the river below Sandford Lock, the Local Board had a salutary dread of the expense and the liabilities that might arise; especially as the Thames has a bad habit of rising very rapidly and overflowing its banks, spreading in all directions, and leaving its burden in hollow places, from which it could not pass again into the river. The Local Board however, at Oxford, for some years afterwards, carried on a great many detached works of drainage, working somewhat up to the system of Sir W. CUBITT, with the idea that a solution of the difficulty would turn up.

Reading, Maidenhead, and Abingdon, may be said to have in those days made no attempt to fulfil the requirements of the sanitary engineers; they have, to this day, a mixture of surface drains, cesspools, open privies, and other ways of dealing with the matter.

Windsor and Eton having thus led the way, things went on pretty well till the year 1859. Windsor had never been a specially unhealthy town, even before it was drained; but

in that year a serious outbreak of fever arose, and many lives were lost. A long investigation, made by Dr. SIMON, was the consequence, and he stated in his report that—"Last " Autumn, by the accidental occurrence of a long-continued " drought, the evils of imperfect drainage were enabled to " inflict more than common injury on the population." This referred to the want of flushing powers that were available in all weathers, and was, it may be said, the first blow which struck at the root of the fallacy of trusting to the rainfall for flushing purposes, which was for years one of the stock arguments for sending all the water of every possible kind through the sewage drain. The effect of this statement was, that the flushing cisterns of Windsor were made perfect, and from that day to this are regularly discharged down the drains, whatever the weather is, so as to ensure perfect regularity. Eton followed in the same track. Both of these towns since then have been always in a satisfactory state as to health, and so, I must add, generally have Oxford, Reading, Abingdon, and Maidenhead.

The greater part of them are supplied with water from the Thames, but not generally from sources immediately underneath the houses.

No attempt was made at deodorization, or any treatment whatever of the sewage of those towns, before it passed into the river, principally from the fact that the mouth of the drains became submerged in floods, and this presented great difficulties to such a work.

It is well known, however, that the PRINCE CONSORT turned his active mind to the subject; and, as the Windsor main drain passed through the Crown property, under the walls of Windsor Castle, he had several plans submitted to him, and he originated some himself; but nothing feasible appeared. He, however, succeeded in designing the only

filter that has ever continued to work for sewage, viz., that by upward action, of which I have prepared, and now exhibit, a drawing. He further contemplated putting up pumping engines and other works, but the river used to rise, as it still does, and upset all calculation, and the whole main drainage then was under water. No filter could act under such circumstances, and as the main drain for the town of Windsor was nearly 7 ft. diameter, and was sometimes running full, the case seemed hopeless. In 1857 the last experiment was made by putting up horse pumps, by his farm bailiff and myself; the Prince's remark, however, being, "It is all very well to-day, but it will be all water to-morrow." From that time my systematic study of the subject may be dated, in the hope of arriving at a solution of the difficulty.

The question of the drainage of the Thames Valley towns may then be said to have slept for some years, during which time a Royal Commission was appointed to enquire into the best method of dealing with the sewage of towns, and many kindred subjects, and they generally recommended irrigation on land for purifying the sewage; but there was an incompleteness in their enquiries, as they evidently conducted their experiments on the sort of principle of taking the sewage when they pleased, and allowing it to go elsewhere when they did not wish it. A vast amount of discussion had also been brought to bear on the subject of the London drainage, and the country rested to see at what decision they would arrive. Finally the Metropolitan Board decided to carry rainfall and everything, in one set of drains, further down the river, and then trust to the chapter of accidents to get out of any difficulties that might arise as to discharging it there.

The evils of the Windsor and Eton drainage, discharging as they did into the Thames, were all under full investigation during these years by myself, as part of my duty.

A new consideration appeared in the matter. The laborious investigations of Dr. SIMON, and his staff of the Medical Department of the Privy Council, began to create alarm in the water companies who drew their supply from the Thames, and the Londoners complained that it was hard upon them to spend three millions on drainage works, if all the towns above them sent their filth into the river. The pressure became greater when Dr. SIMON began to promulgate the doctrine—which he has since absolutely recommended, that water companies should be held liable in pecuniary damages if it could be shown that by their neglect in protecting their sources of supply any organic matter passed into their pipes, and so injured their customers.

The rapidly rising town of Slough in the Thames Valley was the first to take heart, and in 1864 called in engineers and consulting engineers, and acting upon their recommendation, spent something like £5,000 or £6,000 in laying in a system of main drains, which were to take rain water and sewage all in one pipe down to an outlet about a mile from the Thames, and the dilemma arose to which I shall subsequently advert.

The Oxford Board also again commenced proceedings, and after many consultations in 1864, thinking reasonably that every consideration had been given to the London system of Drainage, called in, early in 1865, Mr. BAZALGETTE to advise them as to what they should do.

Much uncertainty prevailed on all hands, and endless schemes were proposed by many people and outsiders, and it did not appear that any harmonious system had yet been recommended which would meet all the requirements of the case.

In the spring of 1865, I published my *Treatise on the Sanitary Management and Utilization of Sewage*, in which all the aspects of the question—sanitary, engineering, and

agricultural—were discussed, and the difficulty attempted to be solved, as previously stated, on the principle of entirely separating the rainfall and subsoil water from the sewage proper, and conducting the two first-mentioned direct to the river, and the last to the land outside the town. The opportunities I enjoyed for studying the question in the Thames Valley were great. I had been engaged in superintending several drainage works in some large establishments where completeness was essential, and had specially under my charge and observation the main drain of Windsor where it passed through the Crown property into the river. From an unremitting study of the subject, my detailed investigations led me to point out that I believed, until the rainfall was entirely separated from the sewage, no satisfactory issue in all its aspects could ever be arrived at, and a compulsory bill for the Thames seemed the only way of bringing the question as to the right system of drainage to a test.

The treatise on its appearing met with considerable ridicule, and some of the criticisms upon it stated, that it was the resuscitated ghost of old theories which had been laid long ago. I published in three months afterwards, *Additional Statements in support of my Plans*, in which a great amount of further evidence confirming my views was given.

In the same year the Rivers Pollution Commissioners, appointed by the Home Office, came to Windsor, and subjected these ideas to a very severe examination; the chairman evidently thinking that some system should be adopted similar to what had been in practice for years of a composite character, by which, as has been stated, drains carried the sewage matter completely in dry weather, and allowed it to overflow in wet weather. To this I expressed the strongest objection, and declined to accept the recommendation. The

effect of this cross-examination was to raise a more decided conviction among other people that these views of entire separation might possibly be right after all.

The effect of this commission was the passing of the Thames Navigation Act in 1866, with very stringent powers to prevent sewage any longer passing into the river; with the water companies subscribing £5,000 a year to the maintenance of the river, on condition that the Conservancy Board exercised these compulsory powers. That Board immediately served notice upon the towns to cease sending their sewage into the Thames.

On the question as to what system of drainage should be adopted, the Rivers Commissioners did not make up their minds, and only said "the dilution, in all cases when pumping was employed should be as limited as possible." This left the question still an open one, and the discussion was renewed.

Meantime, a formidable ally appeared to help to settle the matter. In October 1865, there came a deluge of rain, nearly six inches falling in that month after a long drought, and the main drains of Croydon and Worthing, which were both constructed on the system of putting sewage and rainfall together, were surcharged, and lamentable results followed. These had hitherto been considered model towns, and their praises rung in all quarters. That month of rain, however, flooded some of the houses with sewage, and sent the foul air rushing in every direction with such violence, that disease and death followed. In Croydon alone, 22 fatal cases of fever were stated by Dr. CARPENTER to have been caused by the disturbing effect of these rain-falls.

Many people began to think that such a danger should never arise under a good system, and that neither of those precedents ought to be followed. Meanwhile, those who had

been watching, mainly, the agricultural aspect of the question, found during those same days the fields where irrigation was attempted a sea of water.

The Rivers Commissioners had also pointed out very strongly, and the Local Board of Croydon had taken full credit for it, that they made 6s. 6d. a head of the drainage of their population by their farming process. This was always quoted as casting discredit on the towns in the Thames Valley, that they did not go and do likewise. It however came out by-and-bye, that the Croydon Board sent the drainage of 6,000 of their inhabitants into the metropolitan sewers, because that would not work into their general system, and could not be utilized on their sewage farm. Full explanation of this seeming waste has not yet been given, and the inference drawn was, that they had irrigated with whatever portion they could economically manage, and shifted the burden on some other body of what did not suit their convenience.

Mr. BAZALGETTE next appeared at Oxford on behalf of the system of putting rainfall and everything else in one system of drains, and in his report of January 1866, on that town, he goes out of his way to condemn the separation system, which by that time had begun to make a little way. He says, "A double system of drainage, one for sewage and one for surface water, would involve the construction of two systems of drainage to every house, and two systems of sewers to every street. It would, in fact, double the cost, whilst it would be more complicated and very defective."

When he came to deal with the treatment of the sewage at the outlet, he expressed himself in the following general terms:—"Whilst there is still much to be learned respecting the value of sewage, and the best and most profitable mode of its application, it has been demonstrated

“that the refuse of towns can by this means be advantageously applied, in a tolerably inoffensive manner, to growing crops, and the purified water returned to the river.”

“These facts have not yet been sufficiently developed, and are not so perfectly understood by the majority of agriculturists as to have created much demand for sewage. Some difficulty is frequently experienced in obtaining a proper site for its application, and town authorities must, for a time, be content with moderate returns for the sewage, resting assured, that when once fairly introduced, it will ultimately so compete with other manures as to produce its full market value.”

This report was no sooner published, than it was immediately attacked on all sides; some from the “separation” aspect—some from the absolute certainty which was shown that in heavy rainfalls the main drain he had specified could not possibly pass all the rain and sewage away from Oxford quick enough, and so the town would be flooded, and the catastrophes of Worthing and Croydon be repeated, or as part of London was in July 1867, as afterwards mentioned.

MR. BAZALGETTE answered these objections in a letter in May following, but some members of the board gave such statistics of what the rainfall might be, that at last the board decided his plans could not be accepted, and were too vague and uncertain to show that a satisfactory issue might safely be anticipated if entered upon.

The local surveyor of Oxford then attempted the matter, and some further proposals were made in June 1866, but still, no apparently satisfactory issue could be seen, and the question remained *in statu quo*.

In the *Quarterly Journal of Science* for April 1866, there appeared, from the pen of an able pathologist in the

Thames Valley, a classical article on sewers and sewerage, which was by far the most able review of the whole subject that had yet appeared. Every thing that was definitely settled was there laid down, and enquiry directed in the proper quarter. Our business being to follow, however, the contest on the system of drainage to be adopted, we will only quote the elegant writer of the article in question, where he states the result of his investigation to be "that two opinions might be held on the subject of separation," and evidently his tendency was towards that principle. In a few months more he authorized the weight of his authority to be given on that side, and his influence has been great.

In July 1866, I again published a pamphlet entitled, *The Present State of the Drainage Question*, which brought the matter on a step still further, in which, after reviewing the whole progress of the question up to that time, I added—"I feel no hesitation, therefore, in reiterating my confirmed opinion, that even where towns are already drained and the sewage to be utilized by gravitation, the separation of the sewage from the rainfall is both the most sanitary and economical scheme, and that in all towns where pumping is necessary it is doubly so.

"My reasons for saying so in the latter case may be broadly summed up thus:—that the effect of combining both is,

"1st. To necessitate the construction of drains and the erection of power adequate to meet the maximum flow, and thereby to impose, both at first and afterwards, great additional expenses.

"2nd. To dilute the sewage at uncertain periods, and that in wet weather to such an extent as to render it comparatively worthless for agricultural purposes.

"3rd. To divert from the river the rainfall of such an

“ area, as would, at times, materially add to its volume of
 “ pure water ; to pollute the whole of it, and considerably
 “ to detract from the sanitary results both in the town and
 “ in the country.

“ The effects of separating the rainfall from the sewage
 “ are,

“ 1st. To enable a certain and well-ascertained quantity
 “ to be dealt with, and the consequent erection and maintenance of a power adequate, and no more than adequate,
 “ for the purpose.

“ 2nd. To obtain a flow of sewage sufficiently incorporated with manurial matters to render it agriculturally
 “ useful and profitable.

“ 3rd. To discharge into the river, at periods of rain, a
 “ body of water falling over an extensive area, comparatively pure and unpolluted, and to insure the diversion
 “ of the sewage from the river at all times, and in floods as
 “ much as in dry weather.”

The effect of this was to strengthen still more the supporters of the system of separation.

Broadmoor Asylum, Aldershot Camp, and Hounslow Barracks had by that time been drained on the separate system, and Bedford and Canterbury were under treatment somewhat on the same principle.

It is true that Broadmoor may be urged as a case against me by the advocates of earth closets, as I am well aware that recently that system has been very largely, if not wholly adopted at that place.

I am not at present in a position to give any opinion as to the advantages or disadvantages of the change at Broadmoor ; but, as previously stated, that establishment possesses the very conditions on which, possibly, earth closets may be properly used. It is an isolated prison, in which no difficulty can arise in procuring earth, and no objection can

be raised against the exercise of the most minute supervision and the exaction of the strictest compliance with the rules ; while at Broadmoor a system of foul drainage and irrigation must still be maintained for the water from baths, sculleries, urinals, &c.

In 1866 every one naturally looked to the Rivers Pollution Commissioners for guidance, and before the Thames Navigation Committee the following inconclusive evidence was given by the chairman :—

“An engineer must, as much as possible, confine his “ sewer to sewer work proper, and then he can get the maximum ; that is to say, in wet weather that it shall not pass more than five or six times the volume of water that it “ would in dry weather.”

The Oxford Board again, guided by the administrative ability of Dr. LIDDELL, and the great sanitary skill of Dr. ACLAND, entered upon the stormy waters, and called in Mr. BATEMAN to advise. In February 1867 he made his report. He praised Mr. BAZALGETTE for being the first to present them with any systematic data upon which to proceed ; and adds, that “ he (Mr. BAZALGETTE) lays down a few “ general propositions which may be taken as true in theory “ and sound in practice when applied to the system on which “ his scheme was designed ;” and then he (Mr. BATEMAN) proceeded himself to recommend the separation principle in direct opposition, and adds, that this system will secure “ a “ certainty of working and application which no other “ system will afford.”

In proceeding to deal with the treatment of the sewage of Oxford at the outlet, Mr. BATEMAN stated that it would realize £4,000 per annum, or if differently managed £8,486 per annum, and gave some statistics in support of it, which were of a most dubious character.

Also, among other recommendations which he had made,

and which increased the estimate enormously, and struck at the root of the whole economy of the separation system he had recommended, was one that the sewers should be made large enough for men to enter, which was totally unnecessary. The board, on proceeding to consider this report, among other things, passed the following resolutions, viz. :—

“ That the principle asserted by Mr. BATEMAN, that all
“ main sewers should be large enough to admit of personal
“ examination and occasional cleansing, requires further con-
“ sideration.

“ That Mr. BATEMAN’s estimate for the sewerage, exclu-
“ sive of the land, and without taking into consideration
“ existing sewers, is out of all proportion to the expenditure
“ on the drainage of other towns, and exceeds all previous
“ estimates.

“ That, in view of the above resolutions, Mr. BATEMAN’s
“ contemplated expenditure of £18,000 on reservoirs will be
“ rendered unnecessary, as nothing more than a pumping
“ well will be required.

“ That Mr. BATEMAN’s statement of the quantity of
“ land required for the disposal of sewage at 600 acres,
“ appears by all experience to be considerably in excess of
“ what is necessary.

“ In conclusion your committee unanimously concur in
“ recommending the board not to adopt Mr. BATEMAN’s
“ plans for the drainage of the Oxford district, or for the
“ disposal of the sewage as set forth in his report.”

This resolution was apparently the last attempt that the Oxford Board could make in endeavouring practically to go to work, until new light was thrown upon the subject.

In the spring of the same year (1867) a contest in an open Court took place over the Slough drainage, previously referred to. It was attempted by the Local Board to take forcible possession of a piece of land, on which to erect filters

and deodorizing tanks, through which the sewage was to pass in ordinary times, and from which it was to overflow when heavy rains came on. Mr. DARVILL, Town Clerk of Windsor, defended the case for the owner of the land proposed to be taken; and, not content with showing that deodorization of any kind was a fallacy, he attacked the whole principle on which the system was founded, and proved by the witnesses he produced, to the satisfaction of the Government Inspector, that any system such as that in question, which depended on overflows, was imperfect and dangerous in the extreme. So complete was the case, that from that day to this the decision for Slough has been final; and the board accordingly ordered the street gullies to be shut up and disconnected with the foul drainage.

Notwithstanding the urgent commands of the Thames Conservancy Board to take the sewage out of the river, the towns lay still a little to wait for further light, especially as the Rivers Pollution Commissioners were engaged upon the rivers Aire and Calder. In their report they stated:—

“The largest proportion of rain water may, in all cases, run over the surface into the natural streams; it will not be necessary to form duplicate systems of sewers and drains, but will require intelligent and careful attention to preserve surface gradients and natural outlets for storm waters,—and, where these have been tampered with, to restore and improve them. The sewers and drains of a town should provide for the removal of sub-soil water, the slop and waste water from houses, and the contents of water-closets. These sewers and drains may have storm overflows in connection with the natural streams of the district, so arranged as to prevent the flooding of houses or bursting of the sewers during thunderstorms. All dry weather sewage, and such portion of the surface water due to moderate falls of rain as finds its way to the sewers, will flow down

“with the sewage to the outlet, and be a manageable volume either to apply by gravity or be pumped to land for agricultural uses.”

This, again, was so unsatisfactory a guide for practical operations that it was immediately called in question, as to the meaning of the recommendation. MESSRS. PEARL and GOOCH, surgeons in Windsor, and leading members of the local boards of Eton and Windsor, published an appeal to those who were in the same predicament as they themselves officially were, asking what these statements meant. Overflows, they said, they could not approve, because they stated that six or seven cases of virulent typhoid fever had come under their own medical treatment in the spring of that year, which they distinctly traced to the influence of filth left behind by some of these overflows in the neighbourhood, which were brought into action by the heavy snowstorms and rains of March 1867. They further referred to the evidence given by the Rivers Commissioners themselves, when reporting on the River Lea, in which they ascribed the outbreak of cholera in the East of London, in 1866, in part, at least, “to the stagnant sewage in ditches and cuts, arising in great measure from the storm overflows of the Metropolitan Sewage Works.”

In the same year (1867) there was passed the Sewage Utilization Act, which gave compulsory powers of purchasing land for sewage purposes by local boards, under the Lands Clauses Consolidation Act.

In the summer of that year the borough of Reading had bestirred itself, and obtained a very full report from Mr. WOODMAN, the borough surveyor, and Mr. LAWSON, the engineer. These gentlemen seemed to have followed somewhat in the track of the Rivers Commissioners, and they advised a system of drainage which, it seemed, was questionable, if it was in accordance with the requirements of the

Thames Conservancy Act, which stipulated that “no sewage, “nor water tainted with sewage or other impurities, should “flow into the river.”

We find, for instance, that while they advised a sort of double system of drainage, they still considered it necessary to make some provision to guard against the contingency of “the sewers being overcharged during thunder storms,” and also to provide “a safety-valve, in case of a sudden break “down of the engines or an extraordinary storm of rain.” These were contingencies which could not possibly happen if the separate system was carried out in its entirety.

This report was published in August 1867 ; but, although otherwise complete enough, left the question still practically undecided, as to whether the terms of the Conservancy Act would be thoroughly complied with. Other debateable points in the same report need not here be alluded to, as, although important, they were matters of detail.

In the same summer came one of those lucky heavy rain-falls which helped to prove the case of the advocates of the separation system. On July 27th of that year, according to Mr. BAZALGETTE’s statement, there fell at Greenwich $3\frac{1}{4}$ inches of rain in nine hours. Some portions of London were flooded with sewage and rainfall mixed. The engines provided for pumping the sewers laboured in vain, and could not quickly enough clear the drains. The engineer stated, in his defence, when actions for damages against the Metropolitan Board were threatened, that the engines had done great things—more than they were intended to do—and that it was never contemplated to pump up such a flood as that. As bad luck would have it, the tide rose as the rain fell, and shut the storm overflows, and so the whole system was under difficulties. Was this defence not begging the whole question, and admitting that there was a fatal

error somewhere in principle? It was also stated that this was an exceptional case; but there are records of rain falling at a much greater ratio than even it did at that time. We have even on record, as previously stated, so heavy a fall as 1 inch in 10 minutes,—and the first principle in engineering, every one understands, is to provide against the maximum strain that could come to bear upon any system that is designed where the safety of mankind is involved. In the same way, the great rainfall of October 1865, previously mentioned, was said to be exceptional; but it would not have afforded much consolation to the relatives of those twenty-two people who died at Croydon, in consequence of the break-down which then happened, that they were carried off by a fatal “exceptional” defect in sanitary engineering, which might be put past the possibility of happening, if other means were resorted to.

About the same time another powerful ally appeared in the 9th Report of the Medical Department of the Privy Council. In that Paper Dr. BUCHANNAN brought out important facts as the result of his inquiries into the effects of the systems of drainage that had been adopted in different towns.

He stated that serious outbreaks of fever frequently followed in cases where there was not perfect systematic flushing independent of all rainfall, or where the outfall became occasionally submerged, or when there came down sudden rushes of rain beyond the capacity of the sewers to pass the whole without stoppage; and the inference drawn from this was, that all sanitary operations of this description, on which the life of mankind depended, could not be too regular in their action. It also confirmed the opinion I had always maintained, that the maximum of rainfall that could come in the minimum of time must be

considered, and not an average of one quarter of an inch in twenty-four hours, or some such general statement.

All these combined facts were so alarming, and pointed so strongly in the direction of a system of entire separation of rainfall from sewage, (at any rate, in all cases where pumping had to be resorted to,) that a Committee was formed of the principal members of the Boards of Oxford, Eton, Abingdon, and Windsor (Reading choosing to lie by and wait the issue); and a Memorial was prepared, and afterwards a Petition presented to the Home Secretary, praying for a Committee of the House of Commons to inquire into the whole subject, or that some special Commission should be directed to re-open the question and investigate the matter further than it had been done.

Meantime the Rivers Pollution Commissioners had differed upon some points, to such an extent, that the Home Office dissolved the Commission, and after a long time another was appointed.

The Thames Valley towns considered the question might be referred to them, but for many reasons this was afterwards decided against. They declined to proceed on any course or adopt a new system until it received some official sanction; and the Thames Conservancy did not put their compulsory powers in force while such a formidable question remained unsettled.

At last the Members of the Thames Towns we have mentioned proposed to the Home Secretary that they would themselves be at the expense of an inquiry, provided he gave them the assistance of some Royal Engineer, who from his position and experience could be accepted as above suspicion of professional prejudice or undue influence. The towns, however, very properly reserved to themselves the propriety of fully considering his recommendations, and

were not to be absolutely bound by any decision he might give.

The result was, the nomination, by the Home Secretary, of Colonel EWART, who, in addition to much local experience in England, in barracks, and camps, had been one of the Commissioners appointed by the War Office to inquire into the large subject of the sanitary state of Algeria since it was occupied by the French. Any one who peruses that document will see the comprehensive views he and his fellow Commissioners took of so important a subject.

He commenced his work in June of last year, and his report was published on October 29th.

He states, that he investigated every known system of drainage, and all descriptions of plans, and visited every place where he could find illustration of the different methods.

After dealing with the various systems of drainage adopted on the Continent, and also the earth closet system, he came to the conclusion that he must advise one or other of the three systems of drainage by conveyance in water,—which I have attempted to describe,—and, he adds, as the result of his judgment, clause 69—

“I report to Her Majesty’s Under-Secretary of State to the Home Department, as follows:—

“(1.) That the ‘separate system’ of drainage as above described is the proper principle of drainage to be adopted in the towns of Oxford, Windsor, Eton, and Abingdon.

“(2.) That a complete system of sewers should be laid out, in the above-mentioned towns, to receive all the sewage matter of the towns; and that such sewers, so far from being of such a size as to enable a man to work in them, should be of such dimensions only as may be sufficient to afford a passage to the sewage matter.”

Immediately on this report reaching the several towns, the Local Boards proceeded to consider the matter, and his decision, supported as it is by such clear statements, has been at once accepted. Eton and Windsor, at any rate, have passed resolutions in its favour, and proceeded to prepare plans. Oxford, it is believed, will now also follow in the same course.

Objections which, although previously answered deserve notice, have been raised against the plan of total separation of rainfall from sewage, as recommended in Col. EWART'S report, on the ground that it is both expensive and inexpedient, and to some extent impracticable, to have a double system for the rain water pipes from the backs of houses and from back court-yards, such as exist in the old towns of the Thames Valley. It is obvious that if the rainfall is admitted to any great extent from the back pipes and court-yards, expense must be incurred in making provision for it in the main foul drain; and that not by averages, but for the maximum rain and for the maximum sewage that may come in the minimum of time. It is true, as formerly stated, that a considerable portion of such rainfall would be absorbed, and also that the rush of water would not arrive at any point of the foul drain in the same short time as it falls on the area drained, although these roofs and back court-yards are almost impervious; yet making all allowances for such matters, the admission of the rainfall even in these cases is an element of danger, and subject to economical considerations, which have not been thoroughly investigated by those who have raised the objections.

Of the best method of treatment of the sewage when discharged upon the fields, and the preparation of the land, I feel unwilling at present to enter. The question is so large and important that it may well form the subject of a future

and special discussion before this Institute. It will, probably, be sufficient at present to state that my experience and inquiries would, as a general rule, lead me to set aside two-thirds of an acre for 100 people; but, if the land could be got cheaply, a whole acre for the same number would probably, be better. The land should be laid out in the same manner as water-meadows, or, rather, with a less slope from ridge to furrow, and a mixed system of cropping pursued—changing from Italian rye-grass to roots, and, occasionally, corn crops. The different localities will soon decide what is the best and most profitable system; but, the keeping of ewes, for early lambs, would, likely, be an exceedingly good course of management to adopt, and one which has not yet received its proper share of attention.

I have thought it more advisable in this somewhat too long Paper, to restrict my remarks more especially to the much more debateable question of the principle upon which the drainage of towns should be conducted, as that must be settled first before any really satisfactory result can be obtained. Keeping my mind I hope at all times free from prejudice, and having had no object in view except arriving at the truth in my investigations, and influenced by a pardonable ambition to assist in the solution of the difficult problem before the community, I trust that this Institution will support the conclusion in which those who have been acting with me have daily become more confirmed, that the system of entire separation of rainfall from sewage is the safest and the most proper course to follow.

It is necessary that something should be said of the sub-soil water under a town and the method of dealing with it. The great advantages of lowering the level of this water are undeniable, and there are not such strong objections to admitting this as there are to admitting the

rainfall into the foul drains; but, at the same time, in all practicable cases, it would be preferable to deal with it in some other way. That must be entirely judged of by local considerations, and the origin of the subsoil water must be traced, before any means are taken for lowering it effectually.

It may be objected to the Paper which I have had the honour of reading, that it is more fitted for a meeting of engineers than for one of surveyors, and that the latter have little to do with the question of which system of drainage is adopted in a town. This view would scarcely be concurred in by this Meeting, even if we had not the advantage of so many engineers as Associates of the Institution. In dealing effectually with the drainage of any town it is impossible to say where the responsibility of the engineer ends and that of the surveyor begins. The latter must value all the land taken for drainage purposes; he must appear and give evidence in support of the effect of such drainage and irrigation works on the property surrounding them; he must settle the leases to be granted of such irrigation lands when let; he must advise as to the system of cropping and stocking to be pursued; he must judge of the works necessary to prepare the land for irrigation; and he must be answerable for interfering with the purity of the streams, and must, in other cases, protect them. And it will be for the surveyor to influence the engineer to adopt that system of drainage which will be the most beneficial, not only to the special clients for whom he is engaged, but also to the country at large. It appears to me, therefore, that the opinion of this Institution on the system of drainage which they consider most advisable falls legitimately within their province, and will carry great weight, and that it is most desirable that they should be in unison with the engineers on the subject.

Reverting, however, finally, for one moment, to the question of separation of rainfall from sewage, I would merely point out that, if this system is right, large questions present themselves, such as, "Are all the older systems wrong? Must many towns, and London among them, be drained over again, by restoring their surface drainage, or what is to be done? Is the principle applicable to all towns or only those special towns in the Thames Valley?" A new Sanitary Commission has just been appointed by the Home Office, and we are curious to know what they will enquire into. Will they open this vast subject afresh, and examine all the engineers over again?—or, will they turn their attention to the many other sanitary subjects equally demanding attention?

Allow me to sum up what has been attempted to be proved in this Paper.

Under the system of mixing sewage and rainfall together we have the danger, if not the certainty, of putrid deposits in the sewers, imperfect flushing of the drains, impure air in the streets, large and expensive foul drains leading out of the town, dangerous storm overflows laden with putrid filth, cumbersome and excessive arrangements to make when pumping is necessary, putrid sewage discharged on the fields, unnecessarily extensive land to lay out for irrigation, and, when taken at all times, as it ought to be, liquid to distribute, that must frequently be not only worthless as manure, but injurious to vegetation,—and this profitless labour and expense involved on all hands.

Under the "separate system" it is anticipated we shall have means of dealing rapidly and efficiently with the rainfall, perfect, safe, and continuous removal of the sewage while fresh, cheap and small foul drains, economy at the pumping station, economy in the fields, valuable and com-

paratively innocuous liquid at all times to distribute on the land, and absolute control from first to last.

This question and its kindred subjects are, as pointed out by your President in his opening address, of the first importance; and as many Members of this Institution will, during the next few years, be professionally engaged in considering them, free investigation will be of the greatest benefit; and I may take the liberty of suggesting the first and most pressing to be discussed is that to which this Paper is almost entirely confined, viz., "What is the best system of removing "and utilizing the refuse of the inland towns of this "country?"

Mr. R. B. GRANTHAM (Associate) moved a vote of thanks to Mr. MENZIES for his excellent Paper. Mr. GRANTHAM was sure that the engineer as well as the surveyor must derive great information from it. The system of separation which Mr. MENZIES advocated was one which he (the speaker) had long considered as quite the right thing to do, and he should never allow, in any work with which he was concerned, the storm water to be admitted into the sewers, which, he thought, was a bad principle to adopt for the perfect working of the sewer system. As far as the engineer was concerned, it was difficult for him to judge which was the most suitable soil to irrigate, and what crops would be best.

Mr. T. MARR JOHNSON (Associate), in seconding the vote of thanks, would just mention that we had the concurrence of our friends on the other side of the Atlantic in this mode of dealing with the sewage. In New York the sewage passed chiefly into pipe drains, which were self-cleansing, and he thought that their example was not to be disregarded.

The vote of thanks was then put to the Meeting, and carried unanimously.

Mr. J. H. LLOYD (Associate of Council) said, that having given great consideration to the subject, and being specially interested in the application of the metropolitan sewage, he could not altogether concur in one of the conclusions arrived at by Mr. MENZIES, so far as London, at all events, was concerned. Experience,—and that experience had not been small, nor confined to one year or two years,—had demonstrated that the sewage of the metropolis sent down in its diluted state, including the rainfall and the storm water, was perfectly competent for all purposes of fertilization, and did not need that separation which had been adverted to. He was not arrogant enough to suppose that he understood the question sufficiently to say that the principle which seemed to be applicable to the metropolitan sewage would be equally applicable to the sewage of smaller towns. It might be that, in those cases, the quantity of rain water or storm water, which would come to be mixed with the sewage proper, might so far dilute the matter itself as to render it incompetent to fulfil the fertilizing function which it was hoped and believed was the result generally in the application of sewage. He was glad to see in the room his friend Mr. HOPE, by whom the proposal was made to Parliament to dispose of the sewage of London, and render it valuable. After a long discussion, and much investigation, Committees of both Houses determined that the best method was, as suggested by him, to apply the sewage by gravitation to suitable areas in a liquid form. Having heard other systems proposed, they gave entirely and absolutely their preference to this, and, thereupon, the system had been tried experimentally upon a large farm at Barking, and the result had been the production of most marvellous

crops,—crops not only of rye-grass, but of cereals and of roots of every kind. These results had been obtained with the sewage as it came, in its ordinary flow, along the sewers. He trusted that Mr. HOPE would be able to give them a Paper, showing the results which had been attained upon the lands which had been cultivated with this sewage, and that the Council would give an extra evening for the purpose of discussing such a Paper, as the time of the Institution could not be better employed.

Mr. W. HOPE said if the Meeting desired it, he should be happy to place before them a few facts with regard to his actual experience in the utilization of the sewage of London. He had listened with great pleasure to the very able Paper which had been read, and he did not wish at all to take a position antagonistic to the views which Mr. MENZIES had put forward. Engineers had, perhaps, made many mistakes in the works which they had designed both for the metropolis and other towns, but whether or not the entire separation of the house drainage was practicable, he had very great doubts; and he also had great doubts whether it was desirable, inasmuch as pure house drainage, undiluted with any proportion of rainfall, was, in many seasons, too strong a manure to apply for agricultural purposes. Speaking as a farmer, he thought house sewage, especially from many provincial towns, where the natural or artificial water supply was not as large as in the metropolis, was too strong for young and delicate plants. For his own part, if he were offered the choice at the same price of the house sewage alone, or diluted with a reasonable percentage of water, he should greatly prefer to have the house sewage diluted with water, not merely for grass, but for the market garden vegetables and fruits, which they were now experimenting upon at Barking. Last

summer they produced the finest strawberries shown in Covent Garden Market, and obtained the highest price for them, which was, perhaps, the most satisfactory test of the correctness of his statements. Mr. MENZIES thought, and with very great reason, that at certain times in the year the rain water, and especially what might be termed the storm water, was greater than any ordinary system of sewers could dispose of without some amount of stoppage. No doubt, in most towns that was so, and, of course, they must not look, as Mr. MENZIES properly said, at the best circumstances and conditions of these towns, but they must look at the worst, and not at the highest levels, but at the lowest. Although most towns were situated in such a way that a large proportion of the houses might be drained by gravitation, yet the lowest points of these towns were generally at a very low level indeed, and the storm water might certainly be dammed back by a corresponding rise in the height in the rivers. After all, to a certain extent, it was a question of expense. If the outfall sewers and the pumping stations were made of sufficient size and power, there was no physical reason why the storm water should not be conveyed away as well as the ordinary house drainage. The street washings of all large towns possessed a very great value from an agricultural point of view, and if they could be combined practically with the house drainage for the purposes of agriculture, it would be very desirable. No doubt, in winter, during hard frosts, when plants were making very little growth, so great a proportion of liquid was not desirable; but, even in winter, their experience at Barking was that rye-grass, especially, grew almost every day. Last year they got the first crop of rye-grass at Lodge Farm on the 12th March; this year, on the 26th January: and, although in neither year had they any severe weather, yet they had a good many frosty mornings and nights—weather in which ordinary

forms of vegetation would show very little growth indeed. Nevertheless, they did not apply any great quantity of sewage, simply as a question of economy, as they had to pay for the pumping, and still there was a very great growth, and their crops, though so early as the above dates, were very satisfactory. He thought, therefore, that if the area covered by the town was not excessive, so that the storm water or rainfall was not excessive in proportion to the house sewage from the same area, it would be desirable to unite the two rather than separate them.

In answer to the PRESIDENT, Mr. HOPE intimated that he would have great pleasure in reading a short Paper on the subject of his experience at the next Meeting.

THE
DISTRIBUTION AND AGRICULTURAL
USE OF TOWN SEWAGE,

BY WILLIAM HOPE, ASSOCIATE.

*Read at the Ordinary General Meeting of the INSTITUTION OF SURVEYORS,
on May 3rd, 1869.*

THE PRESIDENT IN THE CHAIR.

IT is with peculiar pleasure that I find myself addressing the Institution of Surveyors upon the agricultural part of the sewage question, for the two-fold reason that I have always found that civil engineers undervalue this plain practical side of the question, and because I have always felt that the whole subject, but more especially this part of it, is one peculiarly within the province of surveyors. But, having said this, it is perhaps necessary that I should say two words in the nature of a personal explanation, to excuse my temerity in addressing surveyors upon a surveyor's question. My excuse is a very simple one, namely, that the question is a new one, in which, as yet, few surveyors have had any opportunity of gaining practical experience; whereas a series of fortuitous circumstances has enabled me to gain more information, and to acquire more experience with regard to the agricultural results to be obtained, than perhaps anyone else.

I lived for some half-dozen years partly in Edinburgh, where I constantly witnessed the marvels of the Craigentinny sewage meadows, and partly in the neighbourhood of

the two celebrated liquid manure farms in Ayrshire; and, as the latter formed the frequent topics of conversation in country houses, I was not only able to see with my own eyes the results which those gentlemen obtained, and the causes of their commercial failure, but I also heard those results and causes discussed and criticized. For the last eight years I have, as many gentlemen present are aware, studied deeply and carefully the question how to dispose of the sewage of London; and my pecuniary stake in the successful solution of this question has been and is so large, that it is, perhaps, the best guarantee that I have left no stone unturned in my endeavours to ascertain the truth. The various experiments conducted by the Metropolis Sewage Company, both at Barking Creek and on their experimental farm a little beyond Barking, as well as those conducted by myself on a smaller scale on my own land, have given me an opportunity of acquiring knowledge in this particular branch of agriculture, which, I believe I may safely say, no one else has enjoyed; and it is only the consideration of these exceptional advantages which has made me presume so far as to address the Institution of Surveyors on such a subject.

Now surveyors, as a rule, are, I need hardly say here, practical and experienced agriculturists; they are, in fact, the agricultural advisers of all the great landowners and farmers in the country, and are thoroughly conversant with all the capabilities and requirements of land, as regards drainage, irrigation, reclamation, and so forth. They are, therefore, the men who should advise both the municipalities and the landowners in the preliminary question of choice of a locality and area on which to utilize the sewage of any town; but municipalities and other "sewer authorities" (as the Act of Parliament has it) seem to have an ingenious way of putting the cart before the horse. Instead of getting a practical man who understands what is to be

done with, and what is to be got from, the sewage after it has been brought to the land, to tell them in what district and on what area to apply their sewage, and then sending for an engineer to tell them how to get it there, they begin where they ought to end, and, sending for the engineer at once, go to the expense of getting elaborate plans made for taking their sewage to some locality where the practical man, when he is at last called in, tells them they either cannot use it at all, or can only use a small portion of it. It will be time enough after they have decided the all-important question of locality and area to call in a great engineer. But there is after all no mystery and no very great amount of science in the drainage of a town and in the conveyance of the liquid refuse to any desired distance, and certainly in the case of any ordinary provincial town an experienced surveyor can do everything that is required; and therefore, as the surveyors possess the agricultural knowledge required, and possess also all the engineering knowledge that can be brought to bear upon so simple a matter as drainage and irrigation, the sewage question is from first to last a surveyor's question, and therefore it is that I propose to communicate to the surveyors the special knowledge which accident has enabled me to acquire.

In considering the utilization of sewage by irrigation, we may usefully divide it into three heads: first, *Conveyance* of the sewage from the town to the country; secondly, *Distribution* throughout the district proposed to be irrigated; thirdly, *Application* of the sewage to the actual soil or crops.

Now, with regard to the first question I need say very little. An experienced surveyor will naturally avail himself of the readiest means at his command for conveying a large body of noxious liquid from one district to another.

He will be guided by local circumstances and local materials in designing his work, and the nature of the work will, in some degree of course, also depend upon whether the levels of the ground permit of gravitation either by purely natural fall or by means of a short lift, or necessitate forcing by expensive machinery. I will merely remark that there is of course a great convenience for distribution in what I may term the luxury of pressure. If the main culvert or sewer be an iron pipe of any description, through which the sewage is forced by powerful engines, it becomes a very easy and simple matter to attach a pipe at any point for supplying any land, no matter where situated; but if the main outfall conveys the sewage by gravitation only, then the sewage can only be distributed by the same means, and of course can only be taken to land on a lower level than the outfall, and this, in many places, becomes a most serious difficulty.

But this brings me in fact to the consideration of the second division of the question, namely, *Distribution*.

The distribution of the sewage of a small town of 10,000 or 20,000 inhabitants is a simple enough affair, for it is distributed on one farm only, and that farm is of course chosen so as to be more or less in a ring fence; but if it is desired to deal with the sewage of a great city, much more contriving is necessary. For short distances and low pressures, earthenware pipes may sometimes be used for the lateral channels, but they are not satisfactory; and it must always be recollected that the bursting or leakage of a sewage pipe is a somewhat serious affair, even in the country. Iron pipes are of course always the handiest and neatest things to deal with, but they are expensive. Earth ditches are perfectly effectual, and are perhaps the most convenient of all for communicating with other minor branches; but unless the lie of the land coincides exactly with the fall re-

quired to be given to distributing channels, the earth ditches soon become very expensive in construction, and wasteful in the space occupied. And in view of the several difficulties and drawbacks attending the use of either ditches or earthenware or iron pipes, I have devised a new method of distributing sewage which I think is likely to prove useful in some localities. It is very simple—consisting merely of sheet iron troughs, with a semicircular section, supported upon rough wooden legs of any required size and length. Such iron troughs, at whatever elevation from the ground—and in most cases a very few feet are quite sufficient—occupy no more space than a ditch would occupy when running with a fall coincident with that of the land itself. Therefore there is no permanent waste of land in a broad embankment, and the outlay becomes less than the outlay in constructing a raised up ditch when a very few inches in height are attained. If any unusual height is necessary, to bridge over a hollow, for instance, the section of the trough may be slightly altered, and instead of being semicircular, the diameter may be diminished, and to the prolongation of the sides of the smaller semicircular trough thus formed may be rivetted stronger plates to act as girders, and so the original sectional area would be preserved. With troughs so constructed, having a few angle irons bent all round them outside, a very strong and durable kind of semi-tubular sewage bridge would be obtained. I may mention that I have made an experiment with about a mile and a half of semicircular troughing far thinner than that which would be used in a permanent work, and that this troughing is placed at an unusual height, being for a great part of its length from 16 to 22 feet above the ground. It is moreover in a most exposed situation, and has nevertheless stood all the severe gales of last winter without the very smallest sign of giving way.

Difficulties for the first few years may arise in arranging

for the distribution of the whole sewage of a large town over a wide area of land if there are a few obstructive people in the area who fancy that they could make more by standing out and refusing to take the sewage, than by taking it, if compulsory powers have not been obtained. But, even in this case, it would be a pecuniary rather than a physical difficulty, for, in the neighbourhood of any large town, the country roads are always numerous, and power may be always obtained from Parliament, on the precedent of the Metropolis Sewage Company's Act, for conveying the sewage in pipes under and along the line of the roads. There need, therefore, be no greater difficulty in designing the different channels by which the sewage of a large town may be distributed to any given number of farms, than there is in an analogous kind of work which has been executed by very many gentlemen now present, namely, draining several separate estates into one common outfall. It is simply inverting the process, and, instead of collecting the water from the various estates into one main channel by which it would run away, bringing the water down the one main channel and then distributing it over the various estates.

Now, with regard to the purely agricultural question of the *Application* of sewage to the soil or crops. I have seen and heard a great deal of vague and loose writing and talking on the different modes of laying out land for irrigation; but farther experience has only served to confirm me in my original opinion that the proper way of laying out land for sewage is, wherever the fall of the land will at all permit it, to lay it out in rectangular "panes," or lands thrown up to a ridge in the centre, a small carrier of say eight or nine inches wide being cut along the top of the ridge by which to irrigate the land. This system combines many advantages, and, so far as I can see, presents no drawbacks.

First of all, the rectangular form admits of easy and simple cultivation by horse and steam power, without turn-wrest ploughs or any other special apparatus, and this of itself is so great an advantage as almost to outweigh anything that could be urged in favour of any other system. But this is, also, the cheapest way of laying out land ; for it is manifest that from the ridge to the furrow there will always be a sufficient fall for the flow of the sewage. Therefore, the actual watering of the plants can be done with certainty and regularity, and all that requires to be attended to is the fall to be given to the carrier in the ridge ; and to regulate this, unless the land is either very flat or very irregular in formation, very little soil need be shifted except along the line of the ridge. Moreover, if, during the first year that the land is laid out, there may be a little too much fall from the ridge to the furrow in one place, or rather too little in another, owing to the shifting of the land to fill up hollows and level rises in the length of the ridge, this irregularity will be diminished every time that the land is worked, and so, in the course of a few years, will gradually disappear. Last year I laid out a small experimental field of some nine acres on this system under peculiar disadvantages, as the point to which alone I could bring the sewage was slightly lower than most other parts of the field ; and, although there was very little difference of level in any part, yet such difference as there was, was against me. The field was also irregularly shaped, one of its sides being more than twice as long as the opposite side, and one of its corner angles very acute, and another very obtuse. But, as I ran my lands so as to abut upon, or tail off on, the side between these two angles, this difficulty vanished ; for, of course, it did not the least signify whether the end of each land was square or not. I also laid out the lands of slightly

varying breadths and of an increasing slope, beginning with a very flat land, and rising to a very steep one—the last land having a fall of one in ten from the ridge to the furrow. The most convenient size of land is 40 or 45 feet wide from furrow to furrow, with a slope of 1 in 20 from furrow to ridge. The best mode of conducting the work, in laying out lands in this way is, after any small amount of cross ploughing for filling up old furrows, and other similar work that may be necessary, has been got through, to plough the land into ridges approximating to the desired height. These ridges should then be rolled very heavily, when it will be seen whether or not their fall is sufficiently continuous to admit of a carrier being dug in them as they are; and if it is found that any shifting of earth is required, the rolling of the ridge will have answered the purpose of making the carting lighter. You will observe that the simplicity of this mode of laying out land, as compared with attempting to alter the levels of the entire surface of a field is very great; the labour is, in fact, minimized, and, moreover, for the future cultivation of each individual crop the form of lands which I have described is, I find, very convenient. Of course, the size of each land is known with accuracy; therefore, all the future cultivation, whether ploughing, or hoeing, or weeding, or harvesting, may be done by piece work, and the quantities of sewage applied and the bulk of produce obtained can be checked and ascertained with very great ease. And thus the farmer has a better opportunity of finding out the exact profit that he makes upon any particular crop.

With regard to the cost of such laying out, this must, of course, depend upon the prior formation of the ground; but my friends, Messrs. JOHN FOWLER and Co., will at any time be happy to undertake throwing up the ridges for £1 an acre; and of course the money, whatever it may be,

spent in forming these ridges is practically in substitution of the ordinary ploughing that the land must receive,—so that this part of laying out the land may practically be done for the cost of, perhaps, one extra ploughing.

Then, as to the shifting of soil along the ridge, it will never be found to be a very heavy item, if the area selected for irrigation is well chosen. Of course, there are many parts of the country where fabulous sums might be spent in such a work; but I think that, if the area is selected by a competent surveyor, accustomed to agricultural work, it will probably require less money for this item of carting than if the land is selected by an eminent engineer, ignorant of agriculture.

It has been objected to sewage irrigation that the land is overburdened with more water than it can dispose of; but this objection can never be urged by any man acquainted with high farming in the best parts of Scotland and England, because he would know that there is no physical difficulty in disposing of any reasonable amount of moisture. It is only a question of drainage; and, upon a stiff soil, a farmer will not grow fine crops, in most parts of the country at all events, without good subsoil drainage, whether he use sewage or not. If, therefore, it is necessary to apply sewage to a retentive soil, it will be requisite that the soil should be drained; but it is hardly fair to charge this against the sewage; it is rather a charge which must be borne by the landowner in order to make his land eligible for high farming, whether his tenant purposes to use sewage, or to fatten cattle with artificial food, and to use large quantities of farmyard and artificial manures. Where the land has been laid out as I have described, in ridges, clearly the position for the pipe drains is in the furrows; and, if the pipes are placed in every furrow, sewage may

be usefully and beneficially applied to the stickiest and most retentive soils; in fact, parts of my experimental field are very sticky and retentive.

One objection to the system of high ridges and wide lands will, I dare say, occur to many; and that is, that such lands cannot be formed without turning up a considerable amount of subsoil. This is, no doubt, true; but, first, there is a large amount of subsoil exposed by laying out land with a spade, on what is termed the catch-water system; and, secondly, my experience with sewage proves that it is so amazing a fertilizer that it is of comparatively little moment in what soil seeds are sown. Therefore, I should always regard with great equanimity the throwing up of subsoil, knowing that the result in crops would not be very materially affected.

We will suppose, then; that as suitable a district as possible, both with regard to the quality of its soil and to the general lie of the land, has been chosen for the application of the sewage of a town, and that the land has been laid out in ridges, as I have described. There remains, then, the question over what area and to what crops to apply the sewage; and, clearly, the area on which it is applied must depend, in some measure, upon the crops selected. One important crop must always be grass; because this is the only crop that is always on the ground, and always more or less in a growing condition. It is the only crop, therefore, to which sewage can be applied more or less usefully on all days in the year; and, wherever any large quantity of sewage is to be disposed of, there is always a population to consume grass, whether in the form of meat, or of dairy produce, or of horse labour. A very considerable quantity of the sewage of any town can, therefore, always be used in the production of grass, without any danger of overstocking the market. The

experience that we have had, both at the Lodge Farm, in the occupation of the Metropolis Sewage Company, and on my own experimental field, shows that sewage is equally applicable to cereal crops as to grass, green crops, and vegetables; but, no doubt, a greater return per acre can be obtained by the production of the latter, because a greater quantity of sewage can be utilized by them than by cereals, and, therefore, it is desirable that the bulk of the sewage should be applied to either grass, green crops, or market garden vegetables. But, in a case where sewage is carried to a considerable distance from a town, into a purely farming district, experience proves that sewage is quite as applicable to cereal crops as to any other during the periods of the year when it can be so applied; and in the early spring, before the summer green crops are sown, probably sewage may be more usefully applied to winter wheat and oats than to anything else. The third crop of wheat, on the same land, the third year running, can now be seen growing, and apparently very healthy, upon a poor gravel at the Lodge Farm; and this result has been obtained exclusively by the use of sewage, and of a surprisingly small quantity. Last year there was a very fair crop indeed of $5\frac{1}{2}$ quarters to the acre, and the sewage applied was only about 500 tons,—equal, in round numbers, at a penny a ton, to about a couple of guineas; and the first year that we tried sewage upon wheat, it was put to one portion of the same field which looked particularly bad. Two portions of this field were carefully measured, and one was left as it was and the other was sewaged with about the same quantity of sewage as mentioned before. The result was very remarkable. The unsewaged portion gave 3 loads of straw to the acre, and 3 quarters 5 bushels of grain; the sewaged portion gave, as was naturally to be expected, a large increase of straw, $4\frac{1}{2}$ loads to the acre, or 50 per cent. of increase, and the figures of the grain were

still more satisfactory, being inverted—namely, 5 quarters and 3 bushels to the acre.

Oats and rye have also been very successfully grown at the Lodge Farm with sewage alone ; and, as a still further proof of the applicability of sewage to cereal crops, I may quote an experiment on a small scale which I conducted last year with Indian corn. I was not able to sow the maize until the end of June, and could give it no sewage until after the middle of July, by which time it had nearly perished from drought. It, nevertheless, grew in the following thirty-three days ninety-six measured inches, or nearly three inches per diem, and most of the cobs ripened perfectly. No doubt, last season was exceptionally hot ; but, had it been sown at the proper time and sewaged immediately, the maize would have had a much better chance, even in a much worse season. I may mention that the theory which I wish to test, by the experiment that I made with this crop last year and which I am going to make with the same crop this year, is to ascertain whether, by feeding it with a manure which it can so readily absorb as sewage, I can make it grow quick enough to bring the cobs forward sufficiently early to ripen during the dry hot weather which we always have—in the south of England at least—in August. Last year's experiment was so far encouraging that, not only was the growth unprecedentedly rapid, but so suitable did the sewage appear to be to this particular crop that the cobs produced were larger and finer than the seed cobs from America. There is no question, therefore, that if the sewage of a town be carried sufficiently far to get into an ordinary agricultural district, its application would be found beneficial to cereal crops.

But we should now consider the quantity of sewage per acre which may be usefully applied to crops of grass, roots, and vegetables, to which the main bulk of the sewage must

always be applied. With regard to grass, I have frequently had controversies with various persons, including some well-known agriculturists, as to the proper kind of grass to which to apply sewage, and also as to the proper time of sowing, the proper quantity of sewage to be applied, and the result to be looked for. Some persons have imagined that sewage can be beneficially applied to ordinary natural grasses year after year, and they cite the Craigentenny meadows at Edinburgh as an example; and cases have been brought to my notice where I myself have been quoted as supporting this notion; but it is an idea which I am altogether opposed to. The water and manure, which together compose sewage, stimulate the growth of all the hardier and ranker kinds of natural grasses to such an extent that in the course of time they choke and kill out all the finer kinds, and the grass becomes the rank, nasty stuff that we see at Craigentenny. Notwithstanding the fact that the Craigentenny meadows have been such a useful example of the powers of sewage, the system followed there is as bad as it possibly can be. There is little else than couch and other similar grasses to be seen, and they are as rank as it is possible to imagine, more like the stuff found in a damp orchard than anything else; and when cut, the stalks are completely blanched from the rankness of the vegetation which excludes all light and air. Where permanent grass, to which sewage is applied, is fed instead of cut, no doubt the effect of constant dressings of sewage is not so injurious; but I cannot believe that it is ever good in our climate to pasture animals on land which is constantly irrigated; still less can I believe that it can be good for animals to run the risk of frequently swallowing with their food short grass mechanically contaminated by sewage; and I am very certain that no such weight of forage per acre can be obtained in this way as can be obtained by the scythe, and with a more systematic cul-

tivation. An occasional dressing of sewage, however, to permanent meadow grass, whether intended for pasture or hay, will be found superior to any kind of solid top dressing. With regard to the proper kinds of artificial grasses to sow for irrigation with sewage, I have not seen any as yet that can at all approach Italian rye grass for vigour of growth or sweetness of herbage. We tried at the Lodge Farm some of the new "*Bromus Schroederi*," but it is very inferior food; and however useful it may be in certain localities where nothing better can be got, it will not bear comparison for feeding with Italian rye grass, while, although it is so coarse, its yield is not nearly as great either in the whole season or at each cutting as that of Italian rye grass.

This year I am trying a small plot of the new "*Bromus Odoratus*," introduced by Messrs. SUTTON & SONS; but I do not expect that it will come up to Italian rye grass.

With regard then to Italian rye grass—the *Lolium Italicum* of botanists—we are told by all the standard works on agriculture that its life is from three to four years, and that it will yield three or four crops in a season. But the true explanation of the habits of this plant, and I doubt not of all other similar forage plants, is, that the plant is capable of growing to a certain number of inches in total height, yielding a certain number of tons per acre in total weight, and making a certain number of efforts towards maturity. Hence, if by stimulating treatment, these efforts can be crowded into one season, the yield is obtained and the plant worn out in one season instead of in four. And this practically is the case with Italian rye grass treated properly with sewage. It should be sown in the middle or end of August, at the rate of three or four bushels to the acre. One light cutting should be obtained that autumn, which, besides giving a slight return, will have the effect of getting rid of the first thin delicate blades

which the plants send up from the seed; and there will then be a strong vigorous plant upon the ground to resist the winter cold, and to yield a crop at the earliest possible moment in the following season.

After this autumnal cutting, the grass may be dressed at the rate of 400 tons per acre per month,—making up a total dressing for the ensuing thirteen months of a little more than 5,000 tons.

When the first crop will be obtained the following season depends, of course, greatly upon the length and severity of the winter. This year, for instance, the first cutting obtained at the Lodge Farm was on the 26th of January; last year, the first cutting was on the 12th of March. But the sewage should be applied even at the time when there is no apparent growth, for the ground, assuming it not to have been previously overburdened with sewage, can store up during the winter months anything that the plants do not utilize; and the plants utilize, even in winter, more than could well be believed without actual experience. Many persons imagine that sewage cannot be applied to any crop, without positive injury, during hard frosts or snow; but this is not the case. The sewage is always above the freezing point, and more so than ordinary running water. The actual contact with the sewage must, therefore, be beneficial to the plants, in protecting them from cold. We, therefore, start in the growing season with vigorous young plants, which have been fed liberally all the winter, and which are panting to burst out as soon as the warm weather comes; and, astounding as it may seem, compared with the number of crops that are ordinarily obtained from Italian rye grass in one season, it is a fact that last year one plot of Italian rye grass, on the Lodge Farm, was cut no less than ten times; and I believe rye grass, reasonably well treated, will always yield ten

crops in any season in the south of England. After such a return in the year following an autumnal sowing, the farmer can well afford to break up his rye grass; and therefore, to obtain the last crop, he can go on cutting it right into the cold weather in November, or even December, regardless of the effect of frost upon the roots of his worn-out plants.

We have found that in the height of the growing season Italian rye grass, for the first ten or twelve days after cutting, will grow at the rate of an inch a day, and that it weighs, on the average, half a ton per acre for every inch in height. The early crops will probably grow 20 to 24 inches in height, or even a little more, weighing in this way ten or twelve tons to the acre before the plants show signs of seeding; and I may mention, that in order to get good results the ground laid out for rye grass should be so subdivided that the different subdivisions may be cut in rotation before they begin to seed. The effect of this treatment, however, is to render the plant more impatient to perform its natural function of reproduction, and this especially so in the very hot weather in July and August, when the crops must be cut at a length not exceeding probably 15 or 16 inches. Thus ten crops would be obtained in the season ranging in weight from perhaps seven up to twelve tons, and a total produce may be looked for, by this treatment, of from ninety to one hundred tons per acre. It is quite true, that we have never yet exceeded seventy-one tons per acre at the Lodge Farm, but that is because the sewage has not been applied in sufficient quantities, and the grass, as a rule, has been sown in the wrong months.

The enormous produce that I have stated ought to be obtained from Italian rye grass, points to that crop as the one which can absorb the largest quantity of sewage. Its appetite may, therefore, be taken as the measure of

the minimum area of land on which the sewage of a town can be applied in any one year, but it must be borne in mind that the Italian rye grass will by no means exhaust the manure contained in the sewage. Whether this is solely because sewage contains ammonia somewhat in excess of the requirements of the plant, or because the plant requires a certain minimum quantity of water to produce the results I have been describing, and, therefore, more liquid sewage has to be given than it can utilize the manure of, I cannot say, but I am inclined to think that, if "dry weather" sewage were diluted for Italian rye grass with as much as 50 per cent. of water, the same results in produce could be obtained from two-thirds of the sewage, and that consequently there could of course be nothing like the same amount of manure left behind. But it will be time enough to try how far we can stretch the sewage, so to say, when we have left off throwing it away. At present we had better consider what should be done to extract the sewage left behind by the rye grass, and on this point we still require a good deal of experience.

Last year, at the Lodge Farm, a very extraordinary crop of oats was grown on a piece of land which, during the previous season, had received four thousand tons of sewage and had yielded seventy-one tons of rye grass to the acre; and such were the strength and luxuriance of the oats, that they clearly did not succeed in exhausting the whole of the sewage; but the experiment is incomplete, inasmuch as that piece of land has been again laid down in grass. I am inclined to think, however, that potatoes would be the most suitable crop to grow in the year following rye grass. We have had some experience in growing potatoes with sewage, and we grew them to a very great size and of very superior quality, but I do not imagine for a moment that they would have been of good quality in a wetter

climate or a stiffer soil than those of the Lodge Farm. Therefore, I should consider it very desirable to obtain for the potatoes the peculiar manure contained in the sewage without the water in which that manure was originally conveyed. Whether a heavy crop of potatoes would be capable of exhausting the whole surplus sewage left by rye grass, I cannot say ; but, assuming that it could, we should then find that the area of the land to which the sewage of a town can be applied must be at least double the minimum area of rye grass which can be grown in any one year.

Now the water supply of London may, probably, be taken as approximating to the average quantity of sewage flowing away from any town in the country ; because, although, perhaps, the actual water supply may be more plentiful, yet the surface drainage, or rainfall, is probably less, as the population is very much denser. The water supply of London, as proved by the official returns, is about 30 gallons per head per diem. This would give upwards of 48 tons of sewage per head in the course of the year ; so that, if we take 50 tons as an easy calculation in round numbers for the quantity of sewage per head flowing out of any town, we shall not be very far wrong. In this way 5,000 tons would represent the sewage of 100 persons ; so that, as the sewage of 100 persons is the *maximum* amount that can be properly utilized by a crop of Italian rye grass, and as the rye grass can be grown only once in two years, we should get 50 persons per acre as the *maximum* proportion of population which it is at all safe to apply. But, of course, it never would suit the convenience of any farmer to grow nothing but a never-ending see-saw of Italian rye grass and potatoes.

With regard to other crops, we have grown $52\frac{1}{2}$ tons of mangold wurzel per acre at the Lodge Farm from the application of 1,100 tons of sewage to land which was completely worked out by white crops. Now 1,100 tons would be

equal, according to the same rough calculation, to the sewage of only 22 persons per acre ; but I do not at all say that this is the proper quantity to apply to such a crop as mangold wurzel. On the contrary, I have no doubt whatever that double the quantity could be applied with a very beneficial effect indeed, and that at least 15 or 20 tons more per acre may be so obtained. Such a yield will strike most persons as altogether unreasonable to calculate on, and so it would be in ordinary farming ; for, in ordinary farming, the weight per acre is diminished by many disturbing causes that are not present in sewage farming. For instance, in the south of England, where mangold flourishes best, many blanks are always to be found in even the best fields. Some seed fails, and some young plants are injured in hoeing, and they cannot be filled up—for, what would be the use of attempting to transplant on an extensive scale unless there were some means of watering after transplanting ? But in sewage farming there ought to be absolutely no blanks at all. First, there is less chance of the seed failing if the ground is nicely moistened with sewage two or three times after sowing ; but, secondly, transplanting with sewage becomes a certainty, and the transplanted roots will thrive almost as well as the original ones. Another great source of loss of weight per acre arises from plants running to seed. Now, at first sight, it may appear ridiculous to say that this could be prevented by any special manure ; but I think I can satisfy every one that it really can be prevented by sewage. Plants run to seed, as a rule, when rain comes after a period of drought, by which their growth has been checked ; it is again stimulated by the rain, and takes a different direction. But with sewage there is no such thing as drought, and, as a matter of fact, in $3\frac{1}{2}$ acres of mangold which I grew with sewage last year, not one single plant went to seed, which is, probably, unprecedented even in that small area.

Again, there is a very serious loss of weight per acre from the *direct* action of drought; for, after the first week of baking hot weather, the roots really stop growing until the next rain comes, and even then, if it is long delayed, the plant has received such a check, and its rind has become so hardened, that it starts again with difficulty and under great disadvantages. Whereas, with sewage properly applied, the growth is *continuous*, and the plant grows more in the scorching hot weather than even in what farmers call "growing weather"—that is, mild, balmy, moist weather; for it enjoys the benefit of the two great incentives to all vegetation—water and sun.

When, therefore, I talk of 70 tons per acre as a weight of mangold which ought to be obtained every season by the use of sewage it is not such an unreasonable thing as it at first appears. And if we apply 2,000 tons per acre to a crop of mangold it would be equivalent roughly to one acre for every 40 persons; and my own opinion is that some such proportion should be the very *minimum* of land which should be laid out for the utilization of the sewage of any town. And it would be greatly for the advantage both of the town and of the farmer if an increased area were put under at all events the possibility of irrigation; for, how often would not the farmer, if his land were laid out for it, be only too glad to give an occasional dressing to a crop of wheat that looked sickly after the March storms, to a crop of turnips that he was afraid of losing from the fly, or even to a crop of potatoes in such a summer as we had last year?

And now, a few words as to the money value of town sewage. When used for market-garden vegetables its value is exceptionally great, as the vegetables produced are of the finest possible quality; being grown with maximum rapidity, on which the quality of vegetables specially depends. Now, it is well known that market-gardeners apply from £10 to

£20 worth of solid manure to the acre, around London at all events; while, to produce the finest crops of cabbages, cauliflowers, or celery only takes from 500 to 1,000 tons of sewage, according to the particular species of seed used, and the particular age at which it is desired to send the crop to market. Taking, then, the highest of these quantities, or, 1,000 tons, as equal to the lowest value for a garden dressing of ordinary manure, or £10 an acre, we should have a total value of 2,400 pence for 1,000 tons of sewage, or nearly $2\frac{1}{2}d.$ per ton; and I have no reason to suppose that this is at all beyond what a market-gardener could afford to pay, having regard to the superior result which he obtains. And it is somewhat curious that this value does not differ very considerably from the only reliable valuation that was ever made of the chemical ingredients in town sewage. The sewage of a town, of course, fluctuates in quantity and quality at different times in the day and in different states of the weather, and there was nothing that I found more difficult in the organization of the Metropolis Sewage Company than to arrive at any reliable estimate as to the value of London sewage per ton; because the various analyses that had from time to time been made were of the contents of individual sewers and not of the entire body of sewage, which at that time had not been collected into one outfall. However, early in the year 1865, I think about the month of February, the high and middle level main intercepting sewers on the north side of the Thames were united at Bow, and thus an opportunity was given to obtain something like an exact knowledge of the composition of town sewage. Accordingly, I put on a gang of men to relieve each other, and a superintendent to look after them, with the sole duty of taking samples of the sewage out of the united sewers at Bow every half-hour night and day continuously for four months. These samples were carefully

analyzed from time to time by Professor Way, and the final result of all these averages gave 8·2 grains of ammonia to the gallon; and careful researches proved that the other ingredients, when added to the value of the ammonia, gave a total value of $\frac{1}{4}d.$ per ton for every grain of ammonia per gallon. We thus got a theoretical value of the sewage of the high and middle level sewers of North London of nearly $2\frac{1}{4}d.$ a ton; but it must be remembered that the sewage coming down the low level sewer, which is not yet completed, will be infinitely richer than that in the other two, inasmuch as the population is very much more dense, so that $2\frac{1}{2}d.$ would not be an exaggerated estimate as the intrinsic value of the chemical constituents of the London sewage. Market-gardeners would also use the sewage at a time of year when the water in which the manure is contained instead of presenting a difficulty would offer an additional advantage, and they could well afford to pay for such an advantage. However, to be on the safe side, I have always taken $1d.$ a ton as the standard price at which the Metropolis Sewage Company should sell the sewage to the farmer; and a very few rough calculations will show that this is a very safe estimate indeed.

To take the case of Italian rye grass. We have seen that 90 to 100 tons per acre of grass ought to be grown from 5,000 tons of sewage in the course of one entire growing season. Now 5,000 tons at $1d.$ are equal to £20 16s. 8d., to which we must add, say, £4 an acre for rent and taxes; £1 an acre for application of sewage, interest on improvement expenditure, and other small items; the mowing of 10 crops a year by machine (for which I may mention the rye grass is particularly suitable) at 3s., £1 10s.; carting 100 tons to the homestead at 6d., £2 10s.; or a total of £29 16s. 8d.—say, £30.

It is unnecessary to debit the account with the plough-

ing, harrowing, rolling, and seed paid for in the previous autumn, because the light crop obtained that autumn will be quite sufficient to pay for these. Now, as I can show that a ton of grass delivered at the homestead is well worth 15s. for feeding cows, if the milk is sold at 15 or 16 pence per barn gallon of 8 quarts upon the farm, or made into butter and sold at about the same price per pound, the skim milk being given to the pigs, we have a gross return of £75 per acre, from which £30 has to be deducted for expenses, leaving a profit of £45 to the farmer, which is *net*; for I should mention that the profit on the milk produced by grass at 15s. a ton delivered at the sheds, is sufficient to pay most handsomely for the capital embarked in the cows.

If we take such a crop as mangold-wurzel, and apply 2,000 tons at 1*d.*, we have a charge for sewage of £8 6*s.* 8*d.* per acre; taking the same figures of £4 for rent and taxes, and £1 for application of sewage, &c., 30*s.* for cultivation, 10*s.* for seed, 10*s.* for hoeing, and 70*s.* for harvesting 70 tons of roots, we have a total charge of £19 6*s.* 8*d.* per acre, and taking the same price of 15*s.* per ton for the value of the food obtained, we have a total yield of £52 10*s.* per acre, or a net balance to the farmer of £33 3*s.* 4*d.*; and I think you will all agree that, as we have produced 52½ tons of mangold at the Lodge Farm from 1,100 tons of sewage, I am not going too far in reckoning upon 70 tons of mangold from 2,000 tons of sewage.

It may be objected that I am dealing with the sewage of a great city, and not of a small town; but though the rainfall is less in London in proportion to the population, yet the water supply is greater, and the two together give at least 75 or 80 tons of sewage per head per annum instead of 50; so if this diluted sewage is of the value I have described, surely a sewage equal to only 50 tons per head per annum cannot

be worth less. Now 50 tons at a penny are equal to 4s. 2d. ; at two pence to 8s. 4d. ; and at two pence half-penny to 10s. 5d. ; so that as the urban population of England, living in towns of 2,000 inhabitants and upwards, exceeds 10 millions, and as almost all these towns are duly polluting the rivers in conformity with the "Towns Improvement Act, 1847," they are propagating scarlet fever and typhus at a direct cost to the towns of Five Millions a year, in addition to the indirect loss to the land and to the working classes; so that we may reckon the loss to the country in gold exported to pay for foreign manure, grain, beef, mutton, hides, wool, bacon, butter, and cheese, at not less than Fifteen Millions Sterling annually.

Mr. F. J. BRAMWELL (Associate of Council) moved a vote of thanks to Mr. HOPE for his valuable Paper, and observed that the two subjects dealt with, viz., the getting rid of a nuisance, and method of increasing the production of food, were of the utmost importance. Crops often grew in fine weather at such a rate as to give rise to the expression, "You can see them grow;" but he never before heard of such a rate as an eighth of an inch per hour throughout the 24 hours of the day, as Mr. HOPE reported to have been the case with his crop of maize. No doubt the joint discussion on this and Mr. MENZIES Paper which preceded it would elicit opinions and facts which would be of the greatest value. Among the points to be cleared up was the important question, how the sewage of a town, if it was constant or nearly so, was to be dealt with by being applied to the land, which did not (at least so he presumed) require the same amount of irrigation at all times of the year; as, also, the cost of bringing the sewage to the point from which it was to be distributed. He had no doubt these questions would be satisfactorily met and fully explained.

Mr. W. J. BEADEL (Member) had great pleasure in seconding the motion. The sewage question he said affected the engineer, the architect, and the surveyor, and, unfortunately, the surveyor was expected to have a smattering of both architecture and engineering, besides a full knowledge of surveying ; also to be competent to give an opinion upon sewage matters. The question mooted by Mr. HOPE was undoubtedly one of the most important of the day, because it could not and would not be tolerated for a moment that the refuse of the food and life of the population should not only be lost to agriculture, but be allowed to pollute the rivers and streams of the country as it now did. He had seen the progress made and the results of the application of sewage at the Lodge Farm at Barking, as well as at Mr. HOPE's own experimental farm, and he could testify they had in no way been overstated in those cases which he had brought forward. He did not know any one who had more fully attempted to perfect the application of sewage than Mr. HOPE, and no one was more competent to deliver a Paper on the subject. He trusted they would have the Papers, both of Mr. MENZIES and Mr. HOPE before them on a future occasion, and he felt convinced that the discussion would be useful not only to surveyors and engineers, but to the public at large.

The PRESIDENT having put the motion, it was carried unanimously.

Mr. S. J. HERRTAGE (Associate) said that, being officially connected with one of the towns (Surbiton) situated within the lower portion of the Thames Valley, he had given the subject some attention, and he must confess that, until lately, he had been an unbeliever in the separate system, as advocated by Mr. MENZIES. On the passing of

the Thames Navigation Act, he (Mr. HERRTAGE) had occasion to prepare a plan for the drainage and utilization of the sewage of all the towns in the lower district of the valley. That plan ultimately fell through, and he was subsequently instructed to prepare plans for the sewerage of the town of Surbiton only. He then went more closely into calculations of cost of the separate system, and he satisfied himself that it was the correct one. Not only was the first cost less, but in the working expenses there was a saving which was equal to a reduction of a halfpenny in the pound in the rates in his district; while it appeared to him that the strength of the sewage delivered for irrigation—if that were a disadvantage—would be no greater than that delivered by the combined system during a continuance of dry weather. He thought, however, that some of the street gullies might be retained in connection with the sewers, and the rain water to some extent admitted, so as to avoid the expense of water for flushing. Another advantage of the separate system was, that the area of land required for depositing the sewage was less. Mr. HOPE said the sewage of 50 persons per acre was the proper amount to be applied; but that depended a good deal on the soil, and on other considerations, which would differ in every case.

Mr. J. MARR (Member), in referring to the opinion expressed by Mr. HOPE, that undiluted sewage was too strong for growing crops, said that he knew well the farm of Mr. MARRIAGE, at Mitcham, which was irrigated by the sewage from Croydon, in a very diluted state; and, although he had been astonished at the extremely early and heavy crops of rye grass there obtained, it was only fair to state that, within his own experience, extraordinary results had been obtained from the application of sewage to land direct from the cesspools. This was invariably the case in cottage

gardens; but without mentioning these, which were perhaps too insignificant, he would particularly refer to a case where it had been applied by market-gardeners renting from 80 to 100 acres of the best market garden ground in the locality of Greenwich, some of which was let at six guineas per acre. On that ground every description of garden produce was grown for the London market; and the crops of celery were most extraordinary. The soil, direct from the cesspool, was dug into the ground, and small and tender plants were put in immediately, and were allowed to grow the same as if they were placed in ground manured in the ordinary way. He feared that if the separate system were carried out in its entirety that the movement of the sewage would become very sluggish, and the drains soon become completely choked by the solid matter, and then manual labour must be employed to get rid of the deposit, or an extensive plan of flushing; both these methods involved considerable expense, and, in the former, a great amount of annoyance to the inhabitants; while the latter would reduce the sewage to the same condition as if it had been subjected to the dilution of a large rainfall. But, assuming the undiluted sewage were delivered at the point for irrigation, he thought it would be in a semi-fluid state, and incapable, to a great extent, of flowing along the channels of distribution, and thus entail a great expense on the farmer and market-gardener, who would be obliged also to resort to manual labour at that point, and so increase the cost that he would be unable to realize those large returns which Mr. HOPE had mentioned. He (Mr. MARR) acknowledged he might be wrong; but he thought it was the duty of all to give their individual opinions on an important question like this, and so obtain information, and elucidate in every way the matter under discussion.

Mr. R. HORSFALL (Member) had hoped the discussion

would have been extended, not only to the irrigation of land, but also to the general utilization of sewage,—a matter which in his county (Yorkshire), and in the north of England generally, was one of vital importance. A commission was sitting in Lancashire at the present time; and they were thoroughly disgusted at the state of the streams, which were a disgrace to the whole country. Manufacturers looked upon a black stream as an indication of the prosperity of the district. Important as the question of utilization of sewage was to London, it was, if possible, of greater importance to the inhabitants of the north of England.

On the suggestion of Mr. E. J. SMITH, the discussion was then adjourned to Monday, May 24th.

AT

THE ORDINARY GENERAL MEETING

Held on Monday, May 24th, 1869,

THOMAS HUSKINSON (MEMBER) IN THE CHAIR,

The discussion on Mr. MENZIES' and Mr. HOPE's Papers, on "The Treatment and Distribution of Town Sewage," was resumed by

Mr. W. MENZIES (Member), who said that, in the Paper which he read before this Institution, he propounded the question—What was the best system of drainage to be adopted for a town in the interior of the country? And in considering this it was essential to bear in mind that when he advocated the carriage of sewage by water, he distinctly stated that, in order to arrive at a satisfactory result, the whole of the water supply of the population, which he assumed at 20 or 30 gallons per head, should be conveyed with the sewage in the foul drains, and that the rainfall off the houses and from the streets and subsoil should be conveyed in a separate and entirely distinct system from the foul drainage. He had said very little about the metropolitan drainage, which, however, he thought capable of much improvement, and believed that, before many years, it must be reconsidered. The towns of the interior of the country were the real difficulty; and, although the views expressed by Mr. HOPE in his most excellent Paper seemed, at first sight, somewhat antagonistic, he thought that, on examination, they might not only be reconciled, but even used in support of his own

opinion. In Mr. HOPE's experiments it appeared that a certain quantity of sewage was pumped from the reservoirs and poured over a certain area of land, and the remainder, not required, was passed into the river. Now, if any such system were sufficient for the interior of the country, the difficulties of the drainage of the Thames Valley and other places would have been solved twenty years ago; but there the *whole of the sewage* must be taken and utilized, whether it were wanted or not. Another difficulty in the question was that, while the agriculturists were under no compulsion to take the sewage, the *towns* were compelled by the recent acts to abstain from draining into the rivers; and the system to be adopted must, therefore, be complete as well as economical in order to satisfy the requirements of the ratepayers.

Mr. HOPE had said, "he should greatly prefer to have the house-sewage diluted with water, not merely for grass but for market garden vegetables and fruit," and that "last summer they produced the finest strawberries shown in Covent Garden Market."

Now, what was the rainfall last summer? According to Mr. SYMONS's Tables, from April to July, there were only $2\frac{1}{2}$ inches of rain, and this fell upon a very few days together. Out of this, there were ninety days in which there was only half an inch, and, therefore, Mr. HOPE was receiving in these ninety days the sewage of London, in the condition in which he (Mr. MENZIES) should always like him to receive it.

In the *Building News* of May 14th, it was said:—

"One of the chief arguments, in an agricultural point of view, brought forward against the 'double system,' is that the sewage is diluted and weakened by the admixture of water to an extent so great as to seriously impair its value as a fertiliser for land, when applied upon the principle of irrigation. At present, experience has demonstrated the

contrary, and has, moreover, unquestionably proved the inestimable advantage of *diluted sewage* in times of *severe drought*, like that with which we were visited last summer, and may probably suffer from again in the coming season."

With regard to this he would only say that though the advantages would doubtless be great, he did not see how in times of severe drought it would be possible to obtain *rain-diluted* sewage. Assuming, as Mr. HOPE had concluded, that the value of sewage was to the farmer 1*d.* a ton, it must be remembered that the nuisance must not only be got into the fields, but out of the towns; large engineering expenses must be incurred, in many cases land taken by compulsion, and people's honest convictions and prejudices as to the proximity of the nuisance met and compensated. At Edinburgh, with shrewd Scotch farmers at hand, £30,000 had lately been spent in putting sewage into the sea as the cheapest way out of the difficulty, because land over which to pass the conduits could not be got without compelling its sale, and to realize a penny per ton, at least 3*d.* per ton must be spent, situated as they were in the midst of a residential locality. He believed the towns of Windsor and Eton, instead of asking $\frac{1}{2}$ *d.* or 1*d.* per ton for their sewage, would be glad to give something to have it taken off their hands, providing their responsibilities were taken also. It was stated that the washings of the streets were so foul that they could not be admitted into any river; but no town should be allowed to get or to remain in such a state, and it should be recollected that whichever system was adopted, the street washings or an overflow of sewage must be admitted into the river. It was also said that without storm water the sewers could not be efficiently flushed. If 20 or 30 gallons per head per day were used regularly all the year round, that would be found quite sufficient. Regularity was the first essential.

Another objection to the separate system was that the small drains for houses would never be flushed at all. This was simply saying that the sewage must accumulate until it was washed away by *rain*. In sanitary science, it was the first essential that all filth should be removed at once from human habitations. It appeared to him that it would be just as absurd to trust to the rainfall to furnish our water supply as to trust to it for drain flushing. Since he had the pleasure of speaking at the Institution last, he was happy to find that Oxford, Windsor, Eton, Kingston, Surbiton, and Twickenham had all passed resolutions in favour of the separate system. That would settle the question very much better than discussion. Much would have to be learnt while the works went on, and he could not but believe that the adoption of the system would be found a success.

Mr. F. J. BRAMWELL (Associate of Council) said :— He had read the Paper of Mr. MENZIES, and gathered from it that Mr. MENZIES objected to the passing of sewage and rainfall down the same sewers, because from want of uniformity in the quantity of water coming down there was the supposed difficulty of dealing with this variable quantity on the land ; and there was the further supposed difficulty of keeping the sewers clear from deposit.

He (Mr. BRAMWELL) had not made rainfall observations for himself, but he would quote those made by Mr. BAZALGETTE, and referred to by that gentleman at a neighbouring Institution. These observations showed that, in only twelve days in each year there was a greater flow of water due to rainfall in any hour than the ordinary flow of sewage per hour in dry weather, during those six hours of the day in which the flow of sewage was at its maximum.

He was quite sure it would be found that the sewers of the Metropolis did not depend upon the extra rainfall of the twelve days per annum to keep them clear, but that

they were so proportioned as to keep clear by means of the ordinary diurnal sewage flow.

If this were so, then the sole practical benefit of a double system of sewers would be to keep off the land the extra rainfall of the twelve days. Now, in his mind, it was a grave question whether it was worth while to go to the expense and complication of a double system of sewers, for the purpose of dealing with the rainfall of only twelve days per annum.

Again, with respect to the question of pumping. Mr. MENZIES appeared to be of opinion that, if there were only a single system of sewers, the pumping power must be equal to the greatest rainfall. If it should really turn out to be the fact, when legislation upon this question had assumed a settled form, that the law insisted upon every particle of water which had once been conducted by the ordinary sewers being excluded from the rivers, then no doubt it would be requisite to provide pumping power sufficient to deal with the greatest quantity of rainfall; and he agreed with Mr. MENZIES in thinking that this was practically impossible, by which he meant that the pumping plant would have to be of such enormous size as to be far more costly than the double system of sewers; but he could not believe that so long as the sewage for 353 days per annum was kept out of the streams, there would be any serious objection raised to their receiving the storm waters of the other 12 days, which, with sewers constructed so as to keep themselves constantly cleansed, would only be very slightly contaminated with sewage matter.

On the general question of the application of sewage to farms, the following points suggested themselves to his mind as requiring elucidation.

First. Assuming, as appeared to be the fact, that the sewage was nearly uniform throughout the year, how was it proposed to get rid on the land of this uniform supply?

Because he presumed (although unhappily he was not practically acquainted with farming) that there were certain months in the year during which land could not deal with the daily amount of sewage it could take at other times. He should be glad to know if this were an admitted fact, and if so, how the difficulty was to be met. Was it to be by having the sewage farm so large that at the time of the year when the land could receive the least amount of sewage per acre, the whole could be disposed of on the farm; and, if this were so, could a farm which had been treated throughout its extent with sewage during the winter, be stinted in its amount of sewage during the summer?

Another point was this. One frequently heard of its being too wet a season for the land. Now it was proposed to use sewage water to an extent equal to, say, one and a-half times the ordinary rainfall in the neighbourhood of London, so that land thus treated would receive a total amount of liquid, compounded of rainfall and sewage together, equal to $2\frac{1}{2}$ times the average rainfall. Now, if this were so, why should not the farmer of the land complain that he had had a very wet season? Was it the fact that the land was able to receive this large extra amount of water, because of the fertilizing matter that came with it; or, was it the fact, that the land could receive $2\frac{1}{2}$ times the ordinary rainfall (even without fertilizing matter) if the land were of a proper description naturally, or were rendered so by efficient draining. If the former were the solution, then the question arose, was there certainly to be found, within a reasonable distance of most large towns, a soil competent to deal with $2\frac{1}{2}$ times the water that ordinarily fell upon it; if the latter, then was it always practicable to render the soil fit by draining? No doubt there were ready answers to these questions, but he thought that others might be in his own condition of not being quite clear as to what those ready answers were.

Dr. ALFRED CARPENTER (Visitor) said that, having studied that subject for some years from a particular point of view, he might, perhaps, be allowed to give the results of his own personal observations. He thought the separation of the rainfall was one question,—the irrigation of land another; and, although the subjects might go hand in hand, each one required a night for discussion. Mr. MENZIES' proposition was especially one which the ratepayers would have to consider. If engineers could show that the separate system might be carried out at a cheaper rate than the combined system, they would have the ear of the ratepayers. But this had not been shown yet; and, until it was so shown, there would be considerable difficulty in large towns in getting a double system adopted. It was a question of cost; and, unless the streets were so thoroughly scavenged as to be rendered completely clean, it was evident that the surface drainage ought not to go into any river from which the potable water of the town was obtained. If it was a tidal river, however, he saw no objection. He had derived much information from Mr. HOPE's Paper, and believed it worthy of the greatest attention on the part of the agricultural student, and of an assembly like the Institution of Surveyors. But it would be read not only by those who were intent upon the best way of getting rid of the sewage, but also by those who were intent on getting as much out of it as possible; and he thought the net profit of £45 per acre to the farmer, as suggested by Mr. HOPE, would be found in excess of the actual result. At any rate, instead of raising such high expectations, it might have been more prudent to follow the policy of GEORGE STEPHENSON, who, being asked by a committee of the House of Commons at what rate he was going to drive his trains, wisely answered, "Twelve miles an hour," and stuck to it,—well knowing he could really get forty. Again, it was clear that it would not pay to run all the trains on our railways express; and the same

argument, he thought, would apply to sewage irrigation, if they were to adopt Mr. HOPE's method of cutting ten crops a year, and breaking up the third year. It could be done, no doubt, but was it prudent to do it? Mr. HOPE had stated that the grass which was grown the third year was not worth having. He held in his hand a cutting of rye grass from a field laid down three years ago. In the first year six cuttings were taken, last year five cuttings, and the cutting of which he produced a sample was the first that had been taken this year. It was 42 in. in length. Mr. HOPE said that the third year's grass was worn out. Now, that very grass was realizing £10 an acre! Adjoining the field in which the sample was cut was another, not quite so forward, but still apparently ready for cutting. He asked the man in charge why he did not cut it. He said that the cowkeepers liked to have it when it was a little older. That which stood for six weeks was much better than that which stood for a month; and he could sell more of the former at fifteenpence per rod than of the latter at one shilling. If strength were wanted in a man, he must be fed on beef and mutton, and not on veal. So, if these cows were fed on young grass, they would not yield so much milk.

Too frequent cuttings, in addition to exhausting the plant, also exhausted the ground, and in the third year the benefit would be nothing like that obtained by cultivating the land in a more moderate manner. Mr. HOPE spoke of the earth ditches being effectual, but he (Dr. CARPENTER) found they were not so, but that it was necessary to have the sewage carried in earthen pipes upon a little raised embankment, and so as to go over the land without going into the ditches at all. The object of getting the sewage on the land was not to let it percolate into the ground, for the roots of Italian rye grass acted as filters or sponges, and absorbed the fertilising material from the sewage, and kept the liquid on the surface. The water would certainly not be rendered

perfectly pure by one application, and it was necessary for the sewage to go over the land two or three times if possible in order entirely to get rid of the phosphates and nitrogenous matter. He thought subsoil drainage would not do for sewage farms. The sewage got into the drains, and so passed into the brook or stream before it was properly purified. The plan of laying out the land was therefore the most important consideration of all. It was very necessary that Local Boards should be able to get readily at land to be used for purposes of irrigation. Take the case of London—on the one hand they had the sewage of three millions of people running to waste; on the other, probably, one million and a half of people never tasting pure milk at all. Many of the number, too, never got a piece of meat from one week's end to the other, and, if they did, had to pay 9*d.* to 11*d.* a pound for it. Then there was this fact—that at his town (Croydon), for instance, for nine years they had grown six cuttings of rye grass per annum, which had been sold on an average at one shilling a rod; and that grass would produce a larger quantity of milk than any grass known. The cow keepers flocked to them for it, and if they could produce treble the quantity it would be sold. Thousands upon thousands died every year in London for want of milk and meat, and they were sending the sewage of three millions of people into the sea, when it would produce for them all they wanted, and enable them to get it at a reasonable price! With regard to the sanitary aspect of the question, he was quite sure that, if carried out in a scientific manner, not the least particle of evil could arise from properly irrigated fields, because the great principle was to get the sewage on to the fields before putrefaction ensued, and not the least miasma was likely to arise, as nature would absorb into the plants all the fertilizing elements before they decomposed and became dangerous to human life. In their Norwood fields people did not know that a sewage farm was

there. There were houses on each side of the fields, and there was seldom anything like a smell. He thought it would be very unwise on the part of towns to allow the privilege of disposing of their sewage to pass into the hands of companies, as the water supply had been allowed to do. Water ought to be supplied by the Local Boards or authorities, and the sewage should be utilized under the same direction. The great aim of the Institution of Surveyors ought to be to induce Local Boards to take up the sewage question, and to persuade owners of property that even if sewage irrigation were carried out in the middle of a gentleman's park, or in front of his house, it would cause no nuisance. It would produce ozone instead of decomposing it, and it would tend to make the country healthier, and some of the greatest necessities of life more plentiful and consequently cheaper.

Professor VOELCKER (Visitor), responding to a call from the Chairman, said :—The great point, it appeared to him, was to get rid of a nuisance, and experiments, if he were not much mistaken, ought rather to be directed to ascertain what maximum amount of sewage they could pump through the land, than to seek to get the utmost farming out of the fertilizing matter in the sewage. They must not shut their eyes to the fact that the towns must get rid of a nuisance. The question was, what was the most profitable application of sewage? He should like to lay his hands upon experiments giving information so much needed. Mr. HOPE at the present time was doing a most valuable work, and, as he was glad to find, on different soils. That led him to make a few observations on the necessity of surveyors noting the character of land required for sewage irrigation. Some land was totally unfit, although of course it might be made fit in time. Almost everywhere, and often in a very limited space, a great variety of soils were

to be found, whether as regarded their depth, the condition of the subsoil, or their chemical nature. The question in the first place to be asked was, What kinds of soil were best adapted for the reception of sewage? He had come to the conclusion that it was not so much a question of chemical composition as of mechanical condition. He did not care whether he had to deal with a clay soil or a sandy soil; in fact he would prefer the better soils for the reception of sewage to poor land, because on the better description of soil the benefits would be greater than on poor land, always providing that it was of proper depth and sufficiently drained to let the water pass through the soil. It was more a question of the division of the particles of soils. It was very difficult to deal with some very fine sandy soils. On the application of large quantities of liquid the particles of such soils ran together very close, and on drying formed a hard crust very injurious to vegetation. On the other hand, if there were large particles of sand or other coarse material, sewage would run through it, and that land would be very useful for the reception of sewage. With respect to subsoil draining, the more porous the land became, and the more nearly the subsoil approached the condition of the surface land the better, and he thought the subsoil should be drained deeper and deeper, and so made a large filtering medium. If they wanted to get rid of the sewage it must not run over the surface, but through the land; though he quite agreed with Dr. CARPENTER that to get the maximum fertility the sewage must run over the land three or four times. The question was, whether they would not get as great a benefit by putting as much sewage as they could get upon the land. That could only be done when it would drain away as fast as it was put upon it. The character of the land and the nature of the subsoil, then, deserved their greatest attention. With regard to the crops most suited for sewage farming,

Italian rye-grass, no doubt, deserved the first attention. It was a crop which got rid of a large quantity of sewage in a short space of time. He looked forward with great hope to the profitable application of sewage to the cultivation of beetroot as a source of supply for the sugar manufacturer. In the north of Germany the yield of beetroot sugar was very much regulated by the fall of rain. If the rainfall during the two first months was small, the yield of sugar would also be small. The sewage farmer could take advantage of the sewage for making up the deficiency of rainfall, and ensure a good yield. The mistake people made in dealing with sewage in an agricultural point of view was in thinking that they had only to let the sewage run in any way, and at any time. They had much to learn in the matter. Although the utilization of sewage was of the first importance to the taxpayer, the agricultural aspect of the question was none the less worthy of attention, and he looked forward with great anxiety to the results of Mr. HOPE's experiments, and thought that the application of sewage to garden produce would be attended with success. He noticed that Mr. HOPE had mentioned some maize on his farm growing at an extraordinary rate. If the summer of this year were to be as warm as the last, he believed they would see something wonderful. If, however, it should prove more temperate, he feared that the maize experiments would not be so successful. Indian corn was a crop which required much heat, concentrated and intense, but beetroot required a warm and short summer, and not a very great amount of heat. Where beetroot could be grown with success they could not successfully grow Indian corn, and *vice versa*. Still, Mr. HOPE's experiments were very useful, even if they proved failures, and many thanks were due for his investigations.

Mr. R. BAXTER (Visitor) expressed his great pleasure in finding that the present subject was engaging the atten-

tion of the Institution of Surveyors. It was imperative that pure water should be supplied to our increasing population, and that cesspools and the system of husbanding and keeping about the house those nuisances which brought disease and death should not be permitted to continue; and, looking at the astonishing results of the application of sewage to land, it was marvellous how little was made available. No one, however, who knew what the Englishman was, or who was acquainted with the habits of the farmers, would be altogether surprised. He had been for the last fifty years very enthusiastic in agricultural matters. When he first began he thought that the whole agricultural system would speedily be reformed. It was he who first reported on the application of bones to agricultural purposes, and since then they had been much used, and with valuable results. They not only had to prove to the man who would bend his mind to it that the application of sewage was profitable, but they had to prove it to men who would not bend their minds to it at all. He had managed a large tract of land in Yorkshire, and he found that the only way of inducing the farmers to adopt any improvement was to get them to travel and see the result. As to chemistry, reading, or argument, they would say their business was to make both ends meet, and they left chemistry, reading, and argument to the scientific man. Mr. HOPE had shown what was wanted—experiment and practical application. Every single case of the kind where the sewage was profitably used was of value, and added to the general fund of knowledge, dispersed prejudices, and aided the development of the whole system. The principal hindrance at present was the difficulty of acquiring land for the purpose of irrigation, and of obtaining way leave for the pipes; but when the utility of the system was more fully proved it would be found that every one who had land within reach would try to get the sewage upon it. The difficulty of the London system was great as it now stood. At Barking, where the metropolitan sewage was

turned into the river, he understood from the public prints that a large deposit was accumulating in the Thames, which seriously interfered with the navigation. If this were so, the ratepayers would have to face a vast expenditure. But the evil would work its own remedy. The line of conduit must be extended further down the country, and the farmers would very soon be induced to take the sewage. He thought it was not very difficult to foresee the end of this when the people were wanting bread and wanting meat, and he believed no great time would elapse before the question would be not "Can sewage be used?" but, "Can I get the sewage?"

Mr. F. W. SHEILDS thought that the most interesting part of the discussion was that raised by Mr. MENZIES, as to whether the separate system of drainage was the preferable one. He thought the Metropolis was not a case in point either on one side or the other. The general system of the drainage of London was long since laid down with a view of taking the rainfall, and, therefore, the engineers of the Metropolitan Board of Works had no option but to make the main intercepting sewers large enough for the reception of rainfall, as well as of sewage. Another reason which rendered London an exceptional case was that its enormous size so increased the length of the main intercepting sewers that if they had in all cases a fall sufficient to keep themselves clear—say 4 or 5 ft. to a mile—they would either be sunk so deep as to become impracticable to execute, or the number of pumping stations must be increased to a very inconvenient extent. The system of making the sewers to contain both rainfall and sewage was, as they all knew, a very costly one in London. It involved immensely increased expense both in construction and in cost of pumping. He believed that the flow of sewage to the London pumping stations varied in quantity from time to time in the proportion of 6 to 1. Thus, at one time it would be sufficient to work one of three pumping engines

at half its power, and at another, all the three engines were going at full power. In his own practice he had not found much difficulty in carrying off the surface drainage of towns otherwise than by putting it into main sewers. Some years since he was entrusted with the formation of the surface drainage of Sydney, New South Wales, a town then of 50,000 inhabitants. The rainfall was occasionally enormous, and such as he had never seen in any other part of the world. Nevertheless he found that by surface drainage alone he was enabled in general to get rid of the whole of the water in a very short time. No underground sewers he had were more than perhaps a hundred yards long, and they chiefly went from the low-lying places into the sea. That, of course, led one to the impression that the separate system advocated by Mr. MENZIES could be generally adopted in practice. He did not think that the drainage of the subsoil need affect the size of the sewers to any great extent. In practice this drainage is effected mostly by the subsoil water following along or around the external circumference of the sewer. That was a further reason why the separate system should receive favourable consideration at the hands of sanitary engineers. Then came the question of delivering the rainfall in combination with the sewage upon the land. The most notable instance he had seen of that was at Marriage's farm at Croydon.

He had once seen it after heavy rains had just occurred, and the farm was a sheet of water from one end to the other. Sewage passing over saturated land in that manner could not be purified. It seemed to flow off the farm simply as it came on, neither better nor worse. In considering how much of the surface drainage should be put into the sewers, in his own practice he generally made a rough calculation of the quantity of water falling upon the roofs and areas of the houses, and provided drains capable of receiving that amount of water in addition to the sewage. He was, therefore, on the whole, an advocate for the separate system. In

selecting ground for the purpose of irrigation, he thought these considerations should as far as practicable be followed; namely, that the land should be as cheap as possible; that the soil should be kept open or porous, if not so naturally, that the sewage might percolate through the land, as well as run over it; that the sewage should not rest, but be in continual motion; and that the level should be such that the sewage might be used over and over again without the necessity of pumping afresh. He would only remark in conclusion, that he, as an engineer did not concur in Mr. HOPE's observation, that no very special qualification or experience was required in carrying out the drainage and waterworks of a town. He was quite sure that to design and carry out economical and efficient arrangements, for these objects great care, thought, and practical experience were required, and he believed that the slur attempted to be cast upon engineers, in the commencement of Mr. HOPE's Paper, was quite undeserved.

Mr. J. H. LLOYD said it was impossible to carry on the discussion at that late hour, and as the present would most likely be the last meeting of the session, and there were many gentlemen in the room who were anxious to join in the discussion, he would propose that it be adjourned to the next session.

Mr. HOPE wished to say, before the motion was put, that he quite admitted it was probable that, under certain circumstances, the separate system of drainage might be a necessity, but this in no way interfered with or militated against the utilization of sewage; and he believed he had complete answers to all the objections which had been suggested on his Paper.

Mr. LLOYD's motion having been carried, the meeting adjourned.

THE ANNUAL GENERAL MEETING,

Monday, May 31st, 1869.

JOHN CLUTTON (PRESIDENT) IN THE CHAIR.

Messrs. R. B. GRANTHAM and JOHN HENRY CLUTTON having been requested to act as Scrutineers of the Ballot for the Election of Council, the balloting list submitted by the Council in accordance with the bye-laws, and the record of attendance of the Members of Council, were read, and the ballot declared open.

The Report of the Council on the state of the Institution, and the statement of receipts and expenditure for the year 1868, were read.

RESOLVED—"That the Report of the Council and the Balance Sheet be received and approved, and be printed and circulated with the Transactions."

RESOLVED—"That the thanks of the Institution be given to Messrs. CHARLES STEPHENSON and ARTHUR GARRARD for the efficient manner in which they have performed their duties as Auditors, and that they be requested to continue their services for the ensuing year."

Messrs. STEPHENSON and GARRARD expressed their willingness again to undertake the duties of Auditors.

RESOLVED—"That the thanks of the Institution are justly due and be given to the President, the Vice-Presidents, and the other Members and Associates of Council, for the able manner in which they have administered the affairs of the Institution, and for the interest they have taken in its progress and success."

RESOLVED—"That the cordial thanks of the Institution be given to Mr. JOHN WORNHAM PENFOLD, the Honorary Secretary, for his zeal and ability in executing the duties of his office, and for his unceasing efforts to promote the general interests of the Institution."

RESOLVED—"That the thanks of the Institution be given to the Treasurer and other Officers of the Institution for the manner in which they have executed their several duties."

The Ballot having been closed, the Scrutineers reported that the following gentlemen had been elected as Council for the ensuing year, viz.:—

President.

JOHN CLUTTON.

Vice-Presidents.

HENRY ARTHUR HUNT,

RICHARD HALL,

JEREMIAH MATHEWS,

EDWARD NORTON CLIFTON.

Members of Council.

CHARLES FREDERICK ADAMS,

THOMAS HUSKINSON,

WILLIAM JAMES BEADEL,

JOHN OAKLEY,

FREDERICK JAMES CLARK,

EDWARD RYDE,

HENRY CRAWTER,

EDMUND JAMES SMITH,

JOHN BAILEY DENTON,

WILLIAM STURGE,

ROBERT COLLIER DRIVER,

FRANCIS VIGERS.

Associates of Council.

JOHN HORATIO LLOYD,

FREDK. JOSEPH BRAMWELL.

RESOLVED—"That the thanks of the Meeting be given to Messrs. R. B. GRANTHAM and J. H. CLUTTON, for their efficient services as Scrutineers."

A vote of thanks to the President for his conduct in the Chair having been passed unanimously, the Meeting separated.

REPORT OF THE COUNCIL

TO THE

ANNUAL GENERAL MEETING, MAY 31ST, 1869.

IN presenting their first Report on the state of the Institution, the Council feel there is much cause for congratulation on the success which has followed the attempt to establish an Institution, with the object of improving the usefulness and status of the profession, and of securing a better medium than has hitherto existed for the interchange of professional opinion and information, as well as for the discussion of subjects of general interest.

The objects and origin of the Institution were so fully set forth by the President in his opening address, that it is unnecessary now to reiterate them; but the Council desire to record the fact, that those gentlemen who took part in the original formation of the Institution, and who thus became technically its first Members, as set out in the bye-laws, undertook the duty, not assuming to themselves any specially prominent position, but as, on the whole, fairly representing the several branches and classes of which it was proposed the Institution should consist; and it has been most gratifying to observe the readiness and cordiality with which many men of the highest standing have presented themselves

for election, either as Members or Associates in the ordinary way, and have thus materially contributed to the success of the project.

The most convenient and proper locality for the rooms of the Institution was a matter of serious consideration with the Committee appointed to select the site, and the Council trust that the position finally decided upon has met the approval of the Members. A lease of these premises has been granted for a term of about eleven years unexpired, to Messrs. JOHN CLUTTON, HENRY ARTHUR HUNT, and RICHARD HALL, the Trustees appointed by the General Meeting of November 9th, 1868. All property of the Institution is vested in them as such Trustees.

Some change in the accommodation for holding the Ordinary General Meeting is under consideration, and it is hoped the state of the finances will admit of an improvement on present arrangements.

Up to the 24th May, 162 Members, 38 Associates, and 2 Students, have joined the Institution, but it is with sincere regret that the Council have to announce the decease of three Members during the past session, viz.:—Messrs. ARTHUR ASHPITEL, FREDERICK CHINNOCK, and J. H. COTTERELL, each of considerable eminence in their several and special branches of the profession.

With regard to the Finances the Council have arranged that so far as possible the current expenses shall be met by the annual subscriptions, and that the entrance fees shall form a capital account from which the cost of permanent improvements to the premises, furniture, fixtures, &c., is to be drawn.

The balance sheet shows the receipts and expenditure up to December 31st, 1868. The total receipts and expenditure from the formation of the Institution in June 1868 to

service. The Council, however, regret that the India Board, in reply to the Memorial, have declined for the present to modify the regulations now in force.

The Council have also under consideration the subject of the Extension of Branch Railways into agricultural districts for agricultural purposes, and hope they will be able to mature some scheme which may form a basis for future legislation.

Ten Papers have been read at the Ordinary General Meetings during the present Session, comprising the following subjects, viz. :—

The Opening Address, by JOHN CLUTTON, President.

Historical Notes, by EDMUND JAMES SMITH.

The Education of a Surveyor, by WILLIAM STURGE.

On Arterial and Agricultural District Drainage, and the Laws connected therewith, by RICHARD BOXALL GRANTHAM.

Parochial Assessments, by EDWARD RYDE.

The future Extension of the Railway System, with special reference to the Influence of Railways on Landed Property and Agriculture, by JOHN BAILEY DENTON.

The Art of Valuing Agricultural Land, by PHILIP DEBELL TUCKETT.

A Review of the Progress made in providing Improved Dwellings for the Industrial Classes, by THOMAS CHATFIELD CLARKE.

The Sanitary Treatment of the Refuse of Towns, and the Utilization of Sewage, by WILLIAM MENZIES.

The Distribution and Agricultural Use of Sewage, by WILLIAM HOPE.

The Council venture to think that the Papers read, and the discussions which have followed on them, have been of considerable interest, and well worthy the attention of Members.

Several subjects of importance, such as those of Improved Dwellings for the Labouring Classes, and the question of Drainage and Utilization of Sewage in its various phases, have among others been inadequately discussed for want of time, and must be again taken up at an early period of the next Session.

The Council are anxious that the Library should contain a collection of books, maps, and documents, for reference and study, which shall be worthy the profession, and they have to acknowledge with thanks many handsome donations of books, and of subscriptions to the Library Fund.

Application has been made to the War Office to sanction the issue of all Ordnance Survey publications to the Institution on favourable terms, and a considerable balance on the library account has been retained in hand for the purchase of maps and other documents, the expenditure of which will depend on the view which the War Office may take of the application made to them.

The Council cannot conclude this Report without expressing their obligation to the Council and Officers of the Institution of Civil Engineers, and especially to Mr. JAMES FORREST, the active Secretary of that Institution, for the courtesy with which they have placed their experience at the command of this Council, and for many suggestions which have been most useful in organising and establishing this Institution.

INSTITUTION C

Dr.

STATEMENT OF RECEIPTS AND EXPENDITURE

RECEIPTS.						REVENUE	
1868. DEC. 31.						£ s. d.	£ s.
112	Members' Subscriptions for 1868, at £3 3s.	...	...	...	...	352 16 0	
17	" " in advance for 1869	...	...	...	...	53 11 0	
12	Associates' " for 1868, at £2 2s.	...	...	...	...	25 4 0	
6	" " in advance for 1869	...	...	...	...	12 12 0	
1	Student's " in advance for 1869	...	...	...	...	1 1 0	
							445 4
Two Months' Rent of Ground Floor Offices to 30th November, 1868							20 0
Sale of Transactions							0 2
							<u>£465 6</u>
						CAPITAL	
						£ s.	£ s.
133	Members' Entrance Fees, at £5 5s.	...	...	...	...	698 5	
18	Associates' " " at £3 3s.	...	...	...	...	56 14	
5	Life Members' Composition Fees, at £31 10s.	...	...	...	...	157 10	
							<u>£912 9</u>
						LIBRARY	
						£ s.	£ s.
To Donations						191 19	
							<u>£191 19</u>
						SUM	
						£ s.	£ s.
Revenue Account						465 6	
Capital						912 9	
Library						191 19	
							<u>£1,569 14</u>
						ASSETS AND LIABILITIES	
						ASSETS.	
						£ s.	£ s.
Cash in hands of Treasurer and Secretary						1,053 16	
Value of Furniture, &c.						153 0	
One Month's Rent of Ground Floor Offices due						10 0	
One Quarter's Rent of Stables due						11 5	
							<u>£1,228 1</u>

REVEYORS.

THE YEAR ENDING DECEMBER 31ST, 1868.

Cr.

COUNT.

EXPENDITURE.					£	s.	d.	£	s.	d.
1868. DEC. 31.										
Liminary Expenses	...	...	...	...				9	15	0
<i>Rent, Insurance, &c.—</i>										
orter's Rent due 25th December, 1868, less Property Tax	...				85	6	3			
urance	...				2	6	6			
l	...				7	10	0			
								95	2	9
ionery, Postage, &c.	...	...	...	...				30	7	8
aries and Wages	...	...	...	...				34	18	0
eral Printing	...	...	...	...				22	15	6
lication of Transactions	...	...	...	...				20	5	7
and Coffee at Meetings	...	...	...	...				2	11	0
na. Glass, &c.	...	...	...	...				11	8	0
isekeeper's Petty Cash Expenses	...	...	...	...				0	11	5
h in the hands of Treasurer	...	...	...	...	231	3	8			
co in the hands of Secretary	...	...	...	...	6	7	8			
								237	11	4
								£465	6	3

COUNT.

								£	s.	d.
Expenses	...	...	...	...	...	...	...	24	13	9
niture	...	...	...	...	...	...	...	153	13	0
airs and Alterations	...	...	...	...	...	...	...	87	15	6
h in hands of Treasurer	...	...	...	...	...	...	...	646	6	9
								£912	9	0

UND.

								£	s.	d.
urchase of Books, Maps, &c.	...	...	...	...	...	...	...	22	0	6
h in hands of Treasurer	...	...	...	...	...	...	...	169	18	6
								£191	19	0

ARY.

								£	s.	d.
venue Account	...	...	...	...	...	...	...	227	14	11
ital	...	...	...	...	...	...	...	266	2	3
ary	...	...	...	...	...	...	...	22	0	6
h in hands of Treasurer and Secretary	...	...	...	...	...	...	...	1,053	16	7
								£1,569	14	3

CEMBER 31ST, 1868.

LIABILITIES.					£	s.	d.
dry Accounts, Rates, and Taxes	...	...	...	say	30	0	0
ance	...	...	...	...	1,198	1	7

Examined with the Books and Vouchers, and found correct, May 28th, 1869,

CHAS. STEPHENSON, }
 ARTHUR GARRARD, } Auditors.

£1,228 1 7

APPENDIX TO VOL. I.

Memoirs.

JACOB HENRY COTTERELL (Member) was born on the 27th of February, 1817, at Bewdley, Worcestershire, at which place his father had commenced business with the late JOSEPH STURGE, of Birmingham, afterwards removing to Bath, where he was for many years in good practice as a Surveyor and Land Agent. In his father's office, and during the early part of his career, Mr. J. H. COTTERELL was extensively engaged, both in this country and in Ireland, on tithe surveys and valuations, and on many of the railway schemes which at that time occupied so much of the public attention. Previous to the opening of the Great Western Railway, he was also connected with extensive improvements of the principal roads in the neighbourhood of Bath, the easy gradients of which, over a difficult country, are lasting evidences of his skill.

Besides the advantage of his father's great professional experience and business connections, Mr. COTTERELL had the privilege of close intimacy with his maternal uncles, the late Messrs. YOUNG & JACOB PLAYER STURGE, Surveyors, Bristol, who entrusted him with important surveys, chiefly in connection with the Tithe Commutation Act. In these he was often assisted by his younger brother, Mr. J. S. COTTERELL, whose early death in a New Zealand massacre, when acting as surveyor under the New Zealand Company in 1841, was greatly deplored.

The extension of the railway system introduced Mr. COTTERELL into a long course of experience in connection with valuation of land, and a great variety of collateral business. Mr. COTTERELL possessed singular energy, both of

body and mind, and in the course of his practice was often engaged in arbitrations, assessments, and valuations of a difficult and onerous kind.

The business was carried on at No. 6, Terrace Walks, Bath, and he was there joined in partnership, in 1852, by Mr. HENRY SPACKMAN, also a Member of this Institution.

Mr. COTTERELL's great interest in agricultural affairs induced him, very early in life, to associate himself with the Royal, and also with the Bath and West of England Agricultural Associations; and the time and attention he devoted to this important subject, there is no doubt, resulted in great benefit to the tenant-farmers with whom he was so frequently brought in contact.

His archæological and historical knowledge of the different localities in the neighbourhood of his own city, was varied and extensive, and the interest he took as president of one of the excursions, at the time of the meeting of the British Association at Bath, in 1864, will be well remembered.

He had been for several years a Member of the Town Council of Bath, first representing the Ward of St. James, and afterwards that of Lyncombe and Widcombe. Like his father before him, he was a Member of the Society of Friends, and an earnest and enthusiastic champion of the Temperance cause: at the time of his death he was President of the Bath Temperance Society, of which, in conjunction with his father, he was one of the principal founders. He was also among the first to recognize the importance of the Oxford Local Examination; and from its first institution (in conjunction with W. LONG, Esq.) he discharged the duties of Secretary, and to his judgment and zeal is due, in a great measure the success which has attended the examinations of the Bath District. Indeed, in all movements calculated to advance the moral and material benefits of the city in which he resided, Mr. COTTERELL was found an active participant, while many recipients of his bounty could testify to his deeds of private benevolence.

His unfortunate connection, as a Director, with the "Bank of Deposit," which became notorious by its collapse some years since, may seem to reflect somewhat on his discretion; his integrity, however, was undoubted, and it is worthy now of record, that acting on the impression that others might have been in-

duced to invest their savings in the undertaking from seeing his name in connection with it, he at once determined to give up the whole of his property to mitigate their loss. This intention he strictly carried out, and it is only a short time since that the heavy liabilities he thereby incurred were cleared off by the subsequent earnings of his profession.

Mr. COTTERELL was incessantly at work; and it is to be feared he greatly overtaxed an excellent constitution. He attended the meeting of the Royal Agricultural Society at Leicester in July 1868, and the intense heat during the week of the show probably brought on or aggravated the disease to which he eventually succumbed. At the close of the meeting, he proceeded to Wales to fulfil a professional engagement, but was taken ill on his way and brought home. He rallied sufficiently to be removed to Weston-super-Mare, and hopes were entertained of his recovery; a relapse, however, occurred, and he died on the 14th August, 1868, in the 52nd year of his age. He was interred in the Friends' Burying Ground near his residence, Bewdley Villa, Widcombe; the Mayor of Bath, and the Members of several of the Societies in which he was interested, following his remains to the grave.

Mr. COTTERELL manifested a great interest in the organization of the Institution of Surveyors, and joined it as a Life Member. One of his last letters, dated from Weston-super-Mare, expressed his anxiety for its success, and intimated his design to make a donation to the library, which would have been very acceptable, but he did not survive to carry out his intention.

FREDERICK CHINNOCK (Member) was born at Frome in Somersetshire, on the 10th of February, 1806. He commenced business on his own account, as an auctioneer and surveyor, in London, about the year 1835, and his tact and skill, combined with a quick perception and agreeable manner, soon gained for him an extensive connection, while his early country associations proved of great advantage to him in the conduct of land sales, and in general estate business. It may be mentioned, that on the sale of the Glastonbury Abbey Estate, by Mr. CHINNOCK, in 1850, the particulars contained a series of views, and a history of Glastonbury; many copies were bought up by the booksellers of the neighbourhood, and

realized afterwards a guinea each. These particulars were much commented on by the newspapers of the day, and gave an impetus to the practice of issuing those sumptuous illustrations which is now so usual when an important estate is brought into the market.

In the rostrum Mr. CHINNOCK was in his element, and he specially possessed the art of infusing life and spirit into an auction sale. In 1844 he was elected a Member of the Select Society of Auctioneers, and for the last eight years was the oldest Member of that society. Of late years he had been much employed in valuations, consequent on the introduction of railway and other public improvements into the metropolis. Up to the time of his decease he displayed great interest in all matters pertaining to his profession; and after the sale of the old Auction Mart in Throgmorton Street, he was elected Chairman of a Company formed for the purpose of erecting the present new Mart in Tokenhouse Yard, a task to which he devoted himself with great assiduity and success.

He took also an active part in public and parochial business, and was for many years a Member of the Vestry of St. James' parish, and latterly, also, a Member of the St. Marylebone Vestry.

Mr. CHINNOCK's business was carried on for some years at No. 28, Regent Street, and afterwards at No. 11, Waterloo Place, where he was joined in partnership, in 1851, by Mr. F. T. GALSWORTHY, and in 1864 by his son, Mr. FREDERICK GEORGE CHINNOCK, both Members of the Institution of Surveyors.

Mr. CHINNOCK was married in 1838, and leaves a family. He died at his residence, No. 37, Portland Place, London, on the 12th January, 1869, in the 63rd year of his age.

ARTHUR ASHPITEL (Member), born December 14th, 1807, was the eldest son of WILLIAM HURST ASHPITEL, an Architect and Surveyor of Clapton. He was partly educated at the celebrated Dr. BURNETT's school at Hackney; but, by a fall in his school-boy days, he so injured his hip joint, that he was quite laid up for some years, and never entirely recovered from the effects of the accident. It was while thus confined to his bed and to the house, that he laid the foundation of those literary and musical attainments, which, in after years, so happily beguiled the hours of leisure enforced upon him by his constantly ailing health.

As his strength improved, he assisted his father in his profession, and in the management of his property; and about the year 1843, he commenced as an Architect and Surveyor on his own account, at No. 5, Crown Court, Old Broad Street, where he was afterwards joined by Mr. JAMES EDMESTON. Among his works, about this time, were churches at Homerton (St. Barnabas), Vernham Dean, and Blackheath, schools at Lea Bridge, and several private residences, and other works in the neighbourhood of London. He also designed the London Silk Trophy and Ribbon Fountains for the Exhibition of 1851, and in 1853 "The Wellington Testimonial," a clock tower placed on the Southwark side of London Bridge. This was afterwards found to be an obstruction to the thoroughfare, and was removed and sold to be erected in private grounds at Swanage. He was also much engaged in compensation cases on the North London Railway, and other metropolitan improvements then in progress.

In 1851 he exhibited, at the Royal Academy, a design for rebuilding Blackfriars Bridge, and throwing open the east front of St. Paul's Cathedral; there were to be shops on the bridge to pay interest on the cost; the wharves were to be taken from the river, and to have a large sewer beneath them.

In 1850, Mr. ASHPITEL entered into partnership with Mr. JOHN WHICHCORD, now a Member of the Institution of Surveyors. Their offices were first at No. 8, Carlton Chambers, Regent Street, and afterwards at No. 2, Poets' Corner; and in conjunction they designed and superintended the erection of baths and washhouses at Swansea, Maidstone, Lambeth, and other similar establishments in various parts of the country, as well as private houses, several churches, the Ophthalmic Hospital and Kent Infirmary at Maidstone, and other works. They also turned their attention to the improvement of dwellings for the labouring classes, and, for a Committee, erected a block of dwellings for artisans at Lambeth; and issued a publication, entitled "Town Dwellings," which advocated the erection of houses in flats, and contained many valuable statements and suggestions.

The twelve months, from October 1853 to October 1854, were devoted by Mr. ASHPITEL to a continental tour, the principal part of the time being spent in Rome, and other parts of Italy. While in Piedmont he had a severe attack of malaria

fever and ague, the effects of which were felt by him for the remainder of his life.

In consequence, chiefly, of failing and uncertain health, his partnership with Mr. WHICHCORD was dissolved in 1855; Mr. ASHPITEL continued to reside at No. 2, Poets' Corner; and from that time, though he carried out several churches, schools, and other architectural works intrusted to him by personal friends, he retired very much from the active exercise of his profession. His perfect mastery of the theory, as well as his practical acquaintance with all the minute details of construction, however, always rendered him liable to be called on for his advice and assistance in architectural and building matters, while the clearness of his perception and his strict impartiality, fully justified the confidence so often reposed on his judgment as arbitrator or umpire in cases of disputed contracts or building accounts. Though his special branch of the profession did not lead him much in that direction, he had an accurate knowledge of chaining, mapping, and levelling; and, notwithstanding his lameness, possessed great facility in working the instruments.

Mr. ASHPITEL joined the Royal Institute of British Architects in 1851, and was an active Member of the Council for several years, serving the office of Vice-President for two years. He was one of the Board of Examiners of Candidates for the office of District Surveyor, under the Metropolitan Building Act of 1855, and took a leading part in the organization and development of the voluntary architectural examination founded by the Institute in 1862. He was for some years Treasurer of the Architectural Exhibition, founded in 1850; and, in fact, for a long time kept that enterprise alive, by supplying the deficiency in its funds, until it obtained sufficient hold on public opinion to render it self-supporting. He joined the British Archæological Association in 1864, and contributed many Papers (*vide Journals*, vols. V., VI., VII., IX.); but, in 1854, some differences having arisen between the Members, Mr. ASHPITEL, with others, resigned their seats at the Council. He afterwards became a Member and Vice-President of the London and Middlesex Archæological Society, founded about that time. In 1847, he had been elected a Member of the Society of Antiquaries, took great interest in their proceedings, and contributed Papers, which will be

found in *Archæologia*, vol. XXXVII. He was also a Member of the Surveyors' Club, having been admitted in 1856.

Confined so much as he was to the house from ill-health, a man of Mr. ASHPITEL's refined and active mind naturally sought refuge in his books, of which he possessed a rare and valuable collection. He was well acquainted with Hebrew, was a critical translator of Greek and Latin, and spoke French and Italian with fluency. His contributions to the periodicals of the day, and the transactions of the learned societies with which he was connected, were very numerous. His first appearance in print was at the age of sixteen, with an Epigram in blank verse, published in the *Weekly Literary Magnet* (Feb. 21st, 1824, p. 61). In 1836 he published *The Reign of Humbug: a Satire*; in 1841, a pamphlet, entitled *A few Facts on the Corn Laws*, defending the agricultural interest; in 1844, *The Year Ninety-eight*; in 1850 and 1851 he nearly rewrote NICHOLSON's Work on *Handrails and Staircases* for JOHN WEALE, the publisher, for whom he also afterwards revised several professional works; in 1857, 1858, and 1862, he contributed very interesting Papers to the Royal Institute of British Architects. He also wrote, for MESSRS. BLACK, the *Biographical Notices of Vanbrugh, Wren, William of Wykeham*, and others, in the *Encyclopædia Britannica*. The Architectural Publication Society, in their *Dictionary of Architecture*, received his zealous assistance, both as a contributor and a reviser, and many of the articles are written by his hand. Readers of *Notes and Queries* also will be able to appreciate the variety and extent of Mr. ASHPITEL's scholarship; scarcely a week passed without the well-known signature of "A. A., of Poets' Corner," being appended to some paragraph of literary or archæological interest. He sometimes wrote an article for the *Morning Post*, and was a constant contributor, both in English and Latin, to the pages of the *Owl*, from the proprietors of which he received, a short time before his death, a rare work of art, in acknowledgment of his services.

Precluded as he was by his lameness from taking much bodily exercise, he was very fond of boating, and usually resided for some part of the year at the sea-side, of late chiefly at Ramsgate, from which place he was brought home in the autumn of 1868, in a very weak state, with an attack of ague from which he never rallied; and after lingering for

some time, died on the 18th January, 1869, in the 61st year of his age, and was buried in the family vault at Hackney.

Mr. ASHPITEL was never married, and by his will has left his library (valued at £3,000) and his collection of Etruscan and antique vases to the Society of Antiquaries; his two pictures of "Rome as it is," and "Rome as it was," drawn and exhibited by him at the Royal Academy in 1858 and 1859, he has intrusted to the national collection at South Kensington. An admirable memoir of Mr. ASHPITEL's life and works, by his friend Mr. WYATT PAPWORTH, will be found in the Sessional Papers of the Royal Institute of British Architects, 1868-9.

LIST OF DONATIONS AND CONTRIBUTIONS UP TO JULY 30TH, 1869.

CONTRIBUTIONS IN MONEY TO LIBRARY FUND.

	£	s.	d.		£	s.	d.
Mr. C. F. Adams . .	10	10	0	Mr. R. Horsley . . .	3	3	0
„ Fredk. Beadel . .	5	0	0	„ H. A. Hunt. . .	10	0	0
„ W. J. Beadel . .	5	0	0	„ Thos. Huskinson .	5	0	0
„ C. D. Beauchamp .	2	2	0	„ E. l'Anson . . .	5	0	0
„ Thos. Bennett. .	5	0	0	„ T. Marr Johnson .	2	2	0
„ C. M. Bidwell . .	5	0	0	„ J. Carter Jonas .	5	0	0
„ J. R. Bonny . . .	5	0	0	„ W. Lambert . . .	3	3	0
„ F. J. Bramwell . .	5	0	0	„ J. Lavender . . .	5	0	0
„ J. Broadbridge. .	2	2	0	„ J. H. Lloyd. . .	10	0	0
„ V. Buckland . . .	3	3	0	„ F. Marrable . . .	3	3	0
„ E. H. Burnell . .	5	0	0	„ S. D. Martin . . .	10	0	0
„ Geo. Chapman. . .	5	0	0	„ J. Mathews. . . .	10	0	0
„ F. J. Clark . . .	10	10	0	„ A. J. Nash	2	2	0
„ T. C. Clarke . . .	3	3	0	„ Geo. Prickett . .	5	0	0
„ E. N. Clifton . .	5	5	0	„ R. H. Rigden . . .	3	3	0
„ Hy. Clutton . . .	5	0	0	„ R. Roberts	5	5	0
„ John Clutton . .	10	0	0	„ E. Rushworth . .	10	10	0
„ J. H. Clutton . .	2	2	0	„ E. Ryde	5	5	0
„ Ralph Clutton . .	2	2	0	„ A. Savill	5	0	0
„ Robert Clutton. .	5	0	0	„ T. D. Smellie . .	3	3	0
„ R. G. Clutton . .	5	0	0	„ C. Bovill Smith .	3	3	0
„ H. Crawler. . . .	5	0	0	„ Danl. Smith, Son,			
„ C. H. Davids . . .	2	2	0	„ & Oakley	10	0	0
„ Edward David. .	2	2	0	„ H. Spackman . . .	5	5	0
„ J. Dent	3	3	0	„ R. F. Sturge . . .	2	2	0
„ J. Bailey Denton .	5	0	0	„ E. L. Thynne . . .	5	0	0
„ H. J. Dowden . .	2	2	0	„ F. G. Thynne . . .	5	0	0
„ R. C. Driver . . .	5	0	0	„ John Toner	3	3	0
„ F. W. Dymond. . .	3	3	0	„ Geo. Trist	10	10	0
„ John Fowler . . .	5	0	0	„ Francis Vigers . .	5	0	0
„ A. Garrard	2	2	0	„ R. Vigers	3	3	0
„ Richard Hall . . .	10	0	0	„ D. Watney	10	10	0
„ R. W. Hall	2	2	0	„ G. B. Williams . .	5	0	0
„ E. Hippiisley . .	2	2	0	„ J. S. Woolley . . .	3	3	0
„ T. Horsey	5	0	0				

DONATIONS OF BOOKS, MAPS, &c.

DONORS.	TITLE OF WORK.
<i>Architect</i> , Editor of the .	"The Architect," 1869.
Badcock, P.	"Five Hundred Points of Good Husbandry." By T. Tusser. 1812.
Barry, J. W.	"The Life and Works of Sir Charles Barry." By A. Barry. 1867.
Bravender, J.	"Journals of the Royal Agricultural Society of England." 20 vols. 1853-62.
Buckland, V.	"On Construction of Railway Carriages, &c." By R. F. Fairlie. Pamphlet. 1868.
<i>Builder</i> , Editor of the .	"The Builder," 1869.
<i>Building News</i> , Editor of the	} "The Building News," 1869.
Clark, F. J.	
"	"The Law of Mines and Minerals." By Wm. Bainbridge. 1867.
"	Baxter's "Library of Practical Agriculture." 1846.
"	Bayldon on "Rents and Tillages." 1864.
"	"The Forester." By J. Brown. 1861.
"	"Enclosure of Commons." By G. W. Cooke. 1864.
"	"The Tenures of Kent." By C. J. Elton. 1867.
"	"The Law of Fixtures." By S. G. Grady. 1866.
"	"Ecclesiastical Law." By G. R. Harding. 1862.
"	"Chronicles of a Clay Farm." By C. W. Hoskyns. 1865.
"	"Land and Engineering Surveying." By H. S. Merrett. 1863.
"	"Copyhold Tenure." By John Scriven. 1867.
"	"The Land Drainage Act, 1861." By Theo- dore Thring. 1862.
Denton, John Bailey .	"The Agricultural Labourer." Pamphlet. 1869.
"	"The Farm Homesteads of England." 1865.
Driver, R. C.	"The Lawes of the Forrest." By J. Manwood. 1598.
Eiloart, F. G.	"De Auctionibus." By T. Mathews. 1673.
<i>Estate Exchange</i> , The .	"Index to the Estate Exchange Registers." 1869.
<i>Estates Gazette</i> , Editor of the	} "The Estates Gazette." 1869.

DONORS.	TITLE OF WORK.
Galsworthy, F. T. . . .	"Principles of Geology." By Sir C. Lyell. 1867..
Grantham, R. B. . . .	"Drainage and Improvement of Lands Act (Ireland)." 1863.
Haywood, William . . .	"Reports to the Commissioners of Sewers of the City of London, 1849 to 1869." By W. Haywood. 2 vols.
Hervon-Heritage, J. S. .	"Thames Valley Outfall." By S. J. Hervon-Heritage. Pamphlet. 1868.
Higham, R.	"London Catalogue of Books," published in Great Britain between 1831 and 1855, with their sizes, prices, and publishers' names, with M.S. additions.
Institution of Civil Engineers	} "Minutes of Proceedings." 1861 to 1868. 7 vols. "Catalogue of the Library of the Institution of Civil Engineers." 1865.
"	
Institution of Mechanical Engineers	} "Proceedings." 1861-8.
"	
Jackson, Frederick . . .	"Plan of the Town of Nottingham." By F. Jackson. 1861.
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"	"Table of Logarithms." By F. Callet. 1827.
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Kershaw, J. T.	Penfold "On Rating." 1869. by J. T. Kershaw.
North of England Institute of Mining Engineers	} "Transactions." Vol. XVII. 1867-8.
"	
Penfold, J. W.	"The Compleat Surveyor." By W. Leybourn. 1722.
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DONORS.	TITLE OF WORK.
Smith, E. J.	"H.C. Committee to inquire into the State of Agriculture." Report and Evidence. 1836.
"	"H.C. Committee on Metropolitan Sewage Manure." Report and Evidence. 1846.
"	"H.C. Committee on Agricultural Customs." Report and Evidence. 1848.
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The Royal Institute of British Architects. . }	"Sessional Papers." 1835-1868. 14 vols.
The Statistical Society .	"Journal." 1869.
Taylor, G.	"Essay on the Distribution of Wealth, and on the Sources of Taxation." Part I. Rent. By the Rev. A. Jones. 1844.
Thomas, J. E.	"Essay on the Encroachment of the Sea between the Mersey and the Bristol Channel." By J. E. Thomas. 1867.
Tuckett, P. D.	"Essay on Covered Homesteads." By P. D. Tuckett. 1862.
"	"Essay on the Four-Course System." By P. D. Tuckett. 1860.
"	"A Comparison of the Cheapness and Advantages of Wood and Iron for Roofs of Farm Buildings." By P. D. Tuckett. 1866.
Watkins, R.	"The Public Works of Great Britain." By F. W. Simms. 1838.

INSTITUTION OF SURVEYORS.

List of Members elected up to July 30th, 1869, with Council for
Session 1869-70.

Members.

ABBOTT, THOMAS	22, Savile Row, W.
ADAMS, CHARLES FREDERICK	Barkway, Herts.
<i>(Member of Council)</i>	
APPLEBY, GEORGE HABIN	Fareham, Hants.
ARDING, CHARLES BENNETT	23, Bedford Row, W.C.
ASHPITEL, ARTHUR	2, Poets' Corner, Westminster, S.W. (deceased.)
BARRY, CHARLES	1, Westminster Chambers, Victoria Street, S.W.
BEADEL, FREDERICK	25, Gresham Street, E.C.
BEADEL, WILLIAM JAMES	25, Gresham Street, E.C.
<i>(Member of Council)</i>	
BEAUMONT, GEORGE, JUN.	East Bridgford, near Nottingham.
BENNETT, THOMAS	Park Farm, Woburn, Beds.
BIDWELL, CHARLES	Ely, Cambridgeshire.
BIDWELL, CHARLES MURIEL	Ely, Cambridgeshire.
BINNIE, THOMAS	1, Nicholson Street, Glasgow.
BIRD, JAMES BINFIELD	West Cowes, Isle of Wight.
BOND, ERASMUS	23, Bedford Row, W.C.
BONNY, JAMES RIPPOTH	43, Camden Road, N.W.
BOWLER, WILLIAM ANTHONY	7, Whitehall Place, S.W.
BRADLEY, CHRISTOPHER LONSDALE	Richmond, Yorkshire.
BRAVENDER, JOHN	Cirencester, Gloucestershire.
BROADERIDGE, JAMES	12, Addison Terrace, Kensington, W.
BROWN, GEORGE	Roborough House, Barnstaple, Devonshire.
BROWN, THOMAS FORSTER	Guildhall Chambers, Cardiff.
BROWN, WILLIAM	Tring, Herts.
BUCK, ALBERT	Worcester.
BUCKLAND, VIRGOE	72, Cannon Street, E.C.
BURNELL, EDWARD HENRY	32, Bedford Row, W.C.
CADLE, CLEMENT	{ Clarence Street, Gloucester, and 87, Chancery Lane, W.C.
CHAPMAN, GEORGE	14, Cockspur Street, S.W.
CHAPMAN, THOMAS	14, Cockspur Street, S.W.
CHINNOCK, FREDERICK	11, Waterloo Place, S.W. (deceased.)
CHINNOCK, FREDERICK GEORGE	11, Waterloo Place, S.W.
CLARK, FREDERICK JAMES	5, Lancaster Place, W.C.
<i>(Member of Council)</i>	

MEMBERS.

CLARKE, THOMAS CHATFEILD	63, Bishopsgate Street Within, E.C.
CLIFTON, EDWARD NORTON	7, East India Avenue, E.C.
<i>(Vice-President)</i>	
CLUTTON, HENRY	9, Whitehall Place, S.W.
CLUTTON, JOHN	9, Whitehall Place, S.W.
<i>(President)</i>	
CLUTTON, ROBERT	Hartswood, Reigate, Surrey.
CLUTTON, ROBERT GEORGE	9, Whitehall Place, S.W.
CLUTTON, WILLIAM JAMES	The Mount, York.
COBB, ROBERT LAKE	Higham, Kent.
COLLIER, JOHN	Salters' Hall, St. Swithin's Lane, E.C.
COLLINS, HENRY HYMAN	5, Queen Street, E.C.
COMELY, JOHN GILL	Winchester, Hants.
COOKE, CHARLES HENRY	11, John Street, Bedford Row, W.C.
COTTERELL, JACOB HENRY	6, Terrace Walks, Bath (deceased).
CRAWTER, HENRY	5, Bedford Row, W.C.
<i>(Member of Council)</i>	
CRAWTER, JOHN	Cheshunt, Herts.
CRICKMAY, GEORGE RACKSTROW	St. Thomas Street, Weymouth.
CULSHAW, WILLIAM	Rumford Court, Liverpool.
CURREY, HENRY	37, Norfolk Street, W.C.
DAVID, EDWARD	Llandaff, Glamorganshire. .
DAVIDS, CHARLES HENRY	Banbury, Oxfordshire.
DENT, JOHN	34, Great James Street, W.C.
DENTON, JOHN BAILEY	22, Whitehall Place, S.W.
<i>(Member of Council)</i>	
DOWNES, HENRY	Basingstoke, Hants.
DRIVER, ROBERT COLLIER	4, Whitehall, S.W.
<i>(Member of Council)</i>	
DURRANT, EDWIN ELMER	King's Lynn, Norfolk.
DYMOND, FRANCIS WILLIAMS	Exeter.
EASTON, WILLIAM	6, Hammet Street, Taunton, Somersetshire.
EILOART, FERDINAND GOZNA	40, Chancery Lane, W.C.
ELLIS, JOHN	Artington, Guildford, Surrey.
EVE, WILLIAM	10, Union Court, Old Broad Street, E.C.
FELTON, GEORGE	Llandudno, Carnarvon.
FULLER, FRANCIS	3, Whitehall Gardens, S.W.
GALSWORTHY, FREDERICK THOMAS	11, Waterloo Place, S.W.
GARDINER, WILLIAM JAMES	110, Great Russell Street, W.C.
HALL, RICHARD	37, Great George Street, S.W.
<i>(Vice-President)</i>	
HALL, RICHARD, JUN.	37, Great George Street, S.W.

MEMBERS.

HALL, ROBERT WRIGHT . . .	37, Great George Street, S.W.
HARVEY, JOHN	6, Victoria Place, Haverfordwest, Pembrokeshire.
HARVEY, RICHARD HART . . .	6, Victoria Place, Haverfordwest, Pembrokeshire.
HAYWOOD, WILLIAM	Guildhall, London, E.C.
HIPPISLEY, EDWIN	Chamberlain Street, Wells, Somersetshire.
HORNBLOWER, JOSEPH WELLS . .	14, Waterloo Street, Birmingham.
HORNBLOWER, JOHN LEWIS . . .	Old Ship Hotel, Brighton.
HORSEY, THOMAS	11, Billiter Square, E.C.
HORSFALL, RICHARD	Halifax, Yorkshire.
HORWOOD, JAMES	10, Paternoster Row, E.C.
HOWELL, CHARLES HENRY . . .	3, Lancaster Place, W.C.
HUDSON, WILLIAM	19, Bennet's Hill, E.C.
HUMBERT, CHARLES F.	Watford, Herts.
HUMPHREYS, CHARLES, Jun. . .	61, Leadenhall Street, E.C.
HUNT, HENRY ARTHUR	4, Parliament Street, Westminster, S.W.
<i>(Vice-President)</i>	
HUNT, JOSIAH	11, Park Street, Westminster, S.W.
HUSKINSON, THOMAS	Epperstone, Southwell, Notts.
<i>(Member of Council)</i>	
HUSSEY, GEORGE HENRY	The Green, High Wycombe, Bucks.
I'ANSON, EDWARD	7A, Laurence Pountney Hill, E.C.
INNES, JAMES	Wroxton, Banbury, Oxfordshire.
JACKSON, FREDERICK	Nottingham.
JONAS, JOHN CARTER	27, Market Hill, Cambridge.
JONES, HARRY	4, Parliament Street, Westminster, S.W.
KERMOCK, EDWIN	Kingston-upon-Thames.
KING, WILLIAM DAVID	130, Queen Street, Portsea, Hants.
KNOLLYS, JAMES EDWARD	Fitzhead Court, Taunton, Somerset.
LAMBERT, WILLIAM	4, New Basinghall Street, E.C.
LAVENDER, JOSEPH	26, Bedford Row, W.C.
LAURANCE, JOHN, Jun.	Elton, Oundle, Northants.
LEE, CHARLES	3, Whitehall Place, S.W.
LOVEJOY, WILLIAM	55, Chancery Lane, W.C.
LYE, JOHN GAUNT	8, Lancaster Place, W.C.
MACAULAY, COLIN ALEXANDER . .	Leicester.
MANN, CHARLES JOHN	21, Parliament Street, S.W.
MARR, JAMES	3, Whitehall Gardens, S.W.
MARRABLE, FREDERICK	21, Whitehall Place, S.W.
MARSH, HENRY EDMUND	54, Cannon Street, E.C.
MARTIN, SAMUEL DICKINSON . . .	1, Park Place, Leeds, Yorkshire.
MATHEWS, JEREMIAH	15, Waterloo Street, Birmingham.
<i>(Vice-President)</i>	

MEMBERS.

MATHEWS, WILLIAM, Jun. . . .	15, Waterloo Street, Birmingham.
MENZIES, WILLIAM	Parkside, Staines, Middlesex.
NEALE, CHARLES JAMES	High Oakham, Mansfield, Notts.
NORMAN, WILLIAM	8, Spring Gardens, S.W.
NORTH, GEORGE	22, Whitehall Place, S.W.
OAKLEY, JOHN	10, Waterloo Place, S.W.
<i>(Member of Council)</i>	
OAKLEY, CHRISTOPHER	10, Waterloo Place, S.W.
OWEN, THOMAS RULE	High Street, Haverfordwest, Pembrokeshire.
PENFOLD, JOHN WORNHAM	17, Parliament Street, Westminster, S.W.
<i>(Honorary Secretary)</i>	
PRICKETT, GEORGE	62, Chancery Lane, W.C.
RAYNBIRD, HUGH EDWARD	Basingstoke, Hants.
RIGDEN, RICHARD HENRY	The Close, Salisbury, Wilts.
ROBERTS, RICHARD	25, Laurence Pountney Lane, E.C.
ROBINS, EDWARD COOKWORTHY	16, Southampton Street, Strand, W.C.
ROSSER, WILLIAM	Llanelly, Carmarthen.
RYDE, EDWARD	17, Parliament Street, Westminster, S.W.
<i>(Member of Council)</i>	
SAUNDERS, CECIL GEORGE	21, Parliament Street, S.W.
SAUNDERS, EDWARD	10, Bridge Street, Westminster, S.W.
SAVILL, ALFRED	27, Rood Lane, E.C., and Chigwell, Essex.
SCOTT, THOMAS COLVILLE	19, King's Arms Yard, E.C.
SHOPPEE, CHARLES JOHN	61, Doughty Street, W.C.
SMELLIE, THOMAS DAVIES	215, St. Vincent Street, Glasgow.
SMITH, CHARLES BOVILL	Wickham, Hants.
SMITH, CHARLES JOHN	10, Waterloo Place, S.W.
SMITH, EDMUND JAMES	16, Whitehall Place, London, S.W.
<i>(Member of Council)</i>	
SNOOKE, WILLIAM	6, Duke Street, London Bridge, S.E.
SOUTHWELL, CHARLES JOSIAH	9, Whitehall Place, S.W.
SPACKMAN, HENRY	6, Terrace Walks, Bath.
SQUAREY, ELIAS PITTS	Odstock, Salisbury, & 22, Great George Street, S.W.
STANLEY, HENRY	Bury St. Edmund's, Suffolk; & 2, Walbrook, E.C.
STATTER, THOMAS	{ Knowsley, Prescott; and Standhill, Whitefield, Manchester.
STEPHENSON, CHARLES	4, Parliament Street, Westminster, S.W.
STEWART, HERBERT THOMAS	4, Upper Charles Street, Westminster, S.W.
STURGE, ROBERT FOWLER	1, Broad Street, Bristol.
STURGE, WILLIAM	1, Broad Street, Bristol.
<i>(Member of Council)</i>	

MEMBERS.—ASSOCIATES.

THOMAS, JOHN EDMUND	{ Hay, Breconshire, and 11, Park Street, Westminster, S.W.
THRING, ROBERT	Winchester, Hants.
THYNNE, EDWARD LEWIS	11, Great George Street, S.W.
THYNNE, FREDERICK GEORGE . . .	11, Great George Street, S.W.
TONER, JOHN	6, Furnival's Inn, E.C.
TRIST, GEORGE	62, Old Broad Street, E.C.
TRUMPER, RICHARD	23, Lincoln's Inn Fields, W.C.
TUCKETT, PHILIP DEBELL	10A, Old Broad Street, E.C.
TURNER, WILLIAM	Ipswich, Suffolk.
VIGERS, FRANCIS	4, Frederick's Place, E.C.
<i>(Member of Council)</i>	
VIGERS, FRANK	4, Frederick's Place, E.C.
VIGERS, ROBERT	4, Frederick's Place, E.C.
WALLEN, JOHN	1, Bishopsgate Street Without, E.C.
WARING, THOMAS	St. Mary Street, Cardiff.
WATKINS, ROBERT	16, Whitehall Place, S.W.
WATNEY, DANIEL	62, Old Broad Street, E.C.
WESTBURY, GILES	Andover, Hants, & 44, Lincoln's Inn Fields, W.C.
WHEELER, THOMAS	8, Lancaster Place, W.C.
WHICHCORD, JOHN	16, Walbrook, E.C.
WILLIAMS, GEORGE BARNES	Frederick's Place, E.C.
WILLMOT, FRANCIS	33, Waterloo Street, Birmingham.
WILSON, ANDREW	7, East India Avenue, E.C.
WITHALL, RICHARD AUGUSTUS . . .	4, Westminster Chambers, Victoria Street, S.W.
WOOD, FREDERICK	Albert House, Rugby, Warwickshire.
WOOD, WILLIAM BRYAN	Chippenham, Wilts.
WOODHOUSE, JOHN THOMAS	Overseal, Ashby-de-la-Zouch, Leicestershire.
WOOLLEY, THOMAS SMITH	South Collingham, Newark, Notts.

Associates.

BADCOCK, PHILIP	{ 9, Whitehall Place, and 4, Aldridge Road, Westbourne Park, W.
BARRY, JOHN WOLFE	17, Parliament Street, Westminster, S.W.
BEAUCHAMP, CHARLES DAVIE . . .	9, Whitehall Place, S.W.
BIDDER, GEORGE PARKER, Jun. . .	3, Paper Buildings, Temple.
BRAMWELL, FREDERICK JOSEPH . .	37, Great George Street, Westminster, S.W.
<i>(Associate of Council)</i>	
BUTLER, ARTHUR	7, Staple Inn, W.C.

ASSOCIATES.

CARLISLE, WILLIAM THOMAS	8, New Square, Lincoln's Inn, W.C.
CLUTTON, JOHN HENRY	9, Whitehall Place, S.W.
CLUTTON, RALPH	9, Whitehall Place, S.W.
COXWELL, JOHN EDWARD	32, Walbrook, E.C.
DEAN, HENRY	Southam, Rugby, Warwickshire.
DODGSON, WILFRED LONGLEY	16, Whitehall Place.
DOWDEN, HENRY JOSEPH	4, Whitehall, S.W.
EASTON, JOHN EDWARD	Southwark Street, S.E., & Erith Iron Works, Kent.
ELLIS, JOHN SMITH	31, Nicholas Lane, E.C.
FAWCETT, JAMES POGUE	5, Lancaster Place, W.C.
FOWLER, JOHN	2, Queen Square Place, S.W.
FRASER, ALEXANDER	32, Brook Street, Hanover Square, W.
GARRARD, ARTHUR	17, Finsbury Square, E.C.
GRANTHAM, RICHARD BOXALL	22, Whitehall Place, S.W.
HERRTAGE, SIDNEY JOHN HERVON	Surbiton, Surrey.
HOPE, WILLIAM	Parsloes, Barking, Essex, and 8, Finch Lane, E.C.
HORSLEY, RICHARD	Gresham Buildings, Basinghall Street, E.C.
HUBBERSTY, HENRY ALFRED	South Collingham, Newark, Notts.
JOHNSON, THOMAS MARR	2, Queen Square Place, Westminster, S.W.
JONAS, HENRY	4, Whitehall, S.W.
LEACH, GEORGE ARCHIBALD, Lieut.-Colonel	{ Tithe and Inclosure Commission Office, St. James's Square.
LEE, CHARLES WILLIAMS	3, Whitehall Place, S.W.
LLOYD, JOHN HORATIO (Associate of Council)	{ 100, Lancaster Gate, W., and King's Bench Walk, Temple.
LOTT, JOSEPH	12, Great George Street, S.W.
NASH, ALFRED JAMES.	Farnham, Surrey.
PHILBRICK, FREDERICK ADOLPHUS	Lamb Building, Temple.
REES, JOHN CHARLES	6, Parliament Street, S.W.
REX, WILLIAM	Ivy Lodge, Walham Green, S.W.
SMALLPIECE, GEORGE MOLINEUX	9, Whitehall Place, S.W.
SMITH, HERBERT EDMUND	16, Whitehall Place, S.W.
SMITH, WILLIAM BINNS	7, New Square, W.C.
SMYTH, EDWARD	9, Whitehall Place, S.W.

ASSOCIATES.—STUDENTS.

TAYLOR, GEORGE	{ Tithe and Inclosure Commission Office, St. James's Square.
TOOGOOD, HENRY	16, Parliament Street, S.W.
TROLLOPE, GEORGE FRANCIS . .	15, Parliament Street, Westminster, S.W.
WARNER, WILLIAM HENRY . . .	9, Guildford Place, Russell Square.
WILLIAMS, RICHARD PRICE . . .	37, Great George Street, S.W.

Students.

BUSHEY, GEORGE, Jun.	9, Whitehall Place, S.W.
RUSHWORTH, EDMUND WALTER .	22, Savile Row, W.

